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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIII NO. 7

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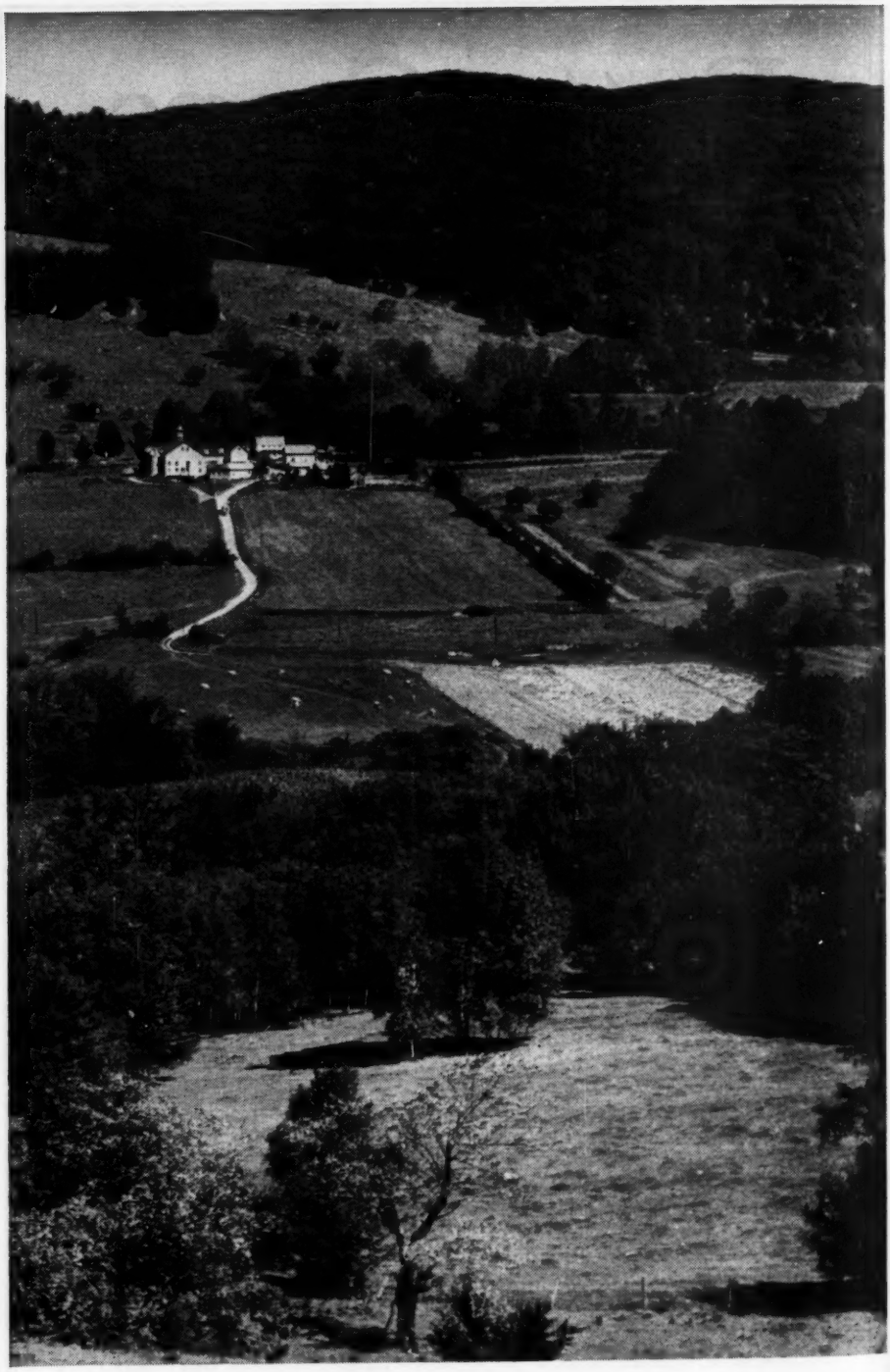

A Peaceful Valley

Better Crops with PLANT FOOD

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VOL. XXXIII WASHINGTON, D. C., AUGUST-SEPTEMBER 1949 No. 7

Lest We Forget . . .

Our Waning Woodlands

Jeff McDermid

RIGHT now, when many of us are communing with nature in the wild, let's ask a question and give an answer. Aside from bugs and diseases, what are the three main causes for the drain on our forests? To this, knowing one's reply: Men, women, and children!

If planks and scantlings were the only good we derive from these giant plants we call "trees," then we could sit back and be as calm about it as we are when we see the horse losing out in the race with the motor age. But cows and sheep and wild animals cannot eat a plank. When seeking a vacation spot for beauty, we don't visit a lumber yard. We can't hunt bears and moose and elk among heaps of two-by-fours and shingles. Neither will a barrier of planks and beams protect our vast watersheds or hold back floods. All of which means that a passable substitute for construction wood or even paper-making wood could be found, if worst comes to worst—but where will we seek grazing, recreational, wild life, and land-conserving benefits without these green and growing trees?

I was raised, and maybe you were too, in the era of reckless and wanton exploitation of the original virgin woodlands. My county's richest nabob made a fortune felling timber and rafting sawlogs to the mills. A few of the wiser ones used "selective cutting" and some even did some replanting. But for the most part, those old ravagers were crazy for immediate profit in an expanding country crying for timber products, and they behaved like a lot of ignorant boys robbing birds' nests. One of my relatives was engaged in the business amid the booms, but he was just an axman and did what he was paid to plunder. But the same thing

happened to the wild buffalo and the Indian—they got in the way of somebody who didn't know their real worth.

HOWEVER, times and minds have changed. Lately I saw a smokejumper demonstration in a large eastern city, staged by the U. S. Forest Service to show how a thorough but dangerous task can be handled by trained parachutists leaping from low-flying planes over burning glades of woodland. But that stunt from the air was perhaps not the big point. Right after the event, a meeting was held to give recognition to a number of vital business executives who had done yeoman work to further the public welfare in preventing needless waste of natural forest resources.

All this change of heart doesn't come too late either. Nature is still operating, and organized study and action to aid her efforts are commendable even at some temporary sacrifice of rugged independence and temporary profits. That we still have some wood resources to rely upon, thanks to new attitudes of recent years, is shown by the fact that in the stress of World War II we were able to find timber products enough at hand without too much loss to carry on the detailed effort. How stupendous this wood usage was for all manner of construction and shipping is indicated by estimates that it was equal to the volume of lumber which would build a city the size of Chicago. Much of that was dissipated, lost at sea, bombed and burned, or lost abroad. Yet the significant idea is that we had it to squander in an emergency, ironically putting a still higher building cost on new houses for new families, too often "jerry-built" and shoddy.

For our security this country is said to have land enough to grow all the trees we need to make timber, plus that safe margin we have found so essential, and even for a little export business too. But we must bolster up our management a lot or this timberland won't be much to lean upon. Out of the 624 million acres of forests, somewhere near 460 million acres are classed as "commercial" property and type. Some of this land is idle, denuded, poorly stocked, some is just pole timber or saplings, and a third of it second-growth saw timber. Only 12 million acres are of tiptop virgin quality.

Complaint is common about the retail prices paid at local lumber yards and the green condition of so much wood going into new houses. This has its factual background. About a third of the Nation's saw timber is derived from less than 10 per cent of the commercial forest land, located in the Pacific Northwest. There is not enough growing stock left in the eastern forest tracts to keep up the present rate of demand. Low-value hardwoods and scrub stock occupy large areas suitable for growth of something better.

FOREST experts often remind us that our saw-timber drain is biting us hard. It is said to exceed the volume of growth by about 50 per cent. Cutting accounts for almost 90 per cent of this drain and the rest is caused by fire, insects, diseases, and neglect.

Present dependence for adequate timber supplies rests mainly on privately owned land. Here the management practices are not as good as many believe they could be. About three quarters of the commercial forests are in private hands and one quarter of the land is owned by state, federal, and local governments.

Forest figures say that about one fourth of the private woodland stands in medium and large holdings of 5,000 acres or over. Of this part of the commercial area, lumber and pulp concerns and individuals hold sway, possibly less than 4,000 owners in all. Then we have the other three fourths owned in tracts of varying sizes, all 5,000 acres or less, decidedly less. More than half of this portion lies in farms and the rest in non-farm tracts often owned by absentees. It foots up to somewhere near four million individuals with an

average forest property of possibly 65 acres apiece.

Only about 8 or 10 per cent of the present harvests of timber on private lands is such as to measure up to fairly good standards of practice. More than 60 per cent of the cutting on private lands is said to be miserably destructive or poor, to say the least. The best

and highest percentage of excellent cuttings is that done on larger properties. Farm properties do not get a good rating on cutting methods, as seen by official foresters. They are rated 73 per cent poor or harmful, 23 per cent just fair, and only 4 per cent good.

So it simmers down after the pot is stirred to the fact that the level of forestry management for public interest can be bettered chiefly by finding ways to induce the ones who have small tracts to improve their systems for the future. Grazing of woodlands by livestock and serious overcutting by untrained persons are two major reasons why the farms show up so poorly. The best way to bring about a gradual improvement is worth discussion in any rural meeting, but to let it be after a talkfest gets us nowhere.

In essence, the job that we have cut out for us is to practically double the estimated annual saw-timber growth of 35 to 40 billion board feet each and every year. It's a plant expert's job, as well as one for the engineer, and the Extension Service worker, and the teacher. The idea is to maintain forest-growing stock in sufficient volume of healthy trees so that when one year's crop is harvested there will be plenty more coming along to provide next year's crop.

I'VE never seen a farmer yet who neglected to provide enough seed and fertilizer and machinery and rotation land to grow another crop when he had harvested and stored his current season's abundance. Just why we should adopt one system of careful advance planning in a vast field of vegetative husbandry and put no thought whatever to similar foresight with the world's tallest and most valuable plant life is hard to understand.

I presume the answer is that in the development of this country we have regarded both trees and grass as outright natural gifts—wild life which had no claim on man for culture or maintenance. It's only in recent years that we have really accepted pastures and woodlands as regular farm crops.

If Nature's herbaceous resources served only to please the eye and vary the scenery, or give comfort to wild animals and vacationists, we would be amply justified in adopting them and becoming stewards for their perpetual welfare.

But you can pick up any scientific guide to the treasures locked inside of trees and find startling evidence that a dwindling timber supply threatens huge industries, endangers personal health and conveniences, and strikes at the incomes of thousands of daily breadwinners.

Nobody wants to dig into all the chemistry and physics involved in a thorough outline of the valuable things

(*Turn to page* 48)

Fig. 1. Members of the Winter-grazing Tour leaving Lefler's farm, Stanley county, North Carolina, January 1949.

The Red Hills of the Piedmont Need More Green Blankets

By James A. Naftel [1]

Auburn, Alabama

THROUGH the establishment of winter-grazing crops it is possible and practical to cover our red hills of the Southeast with green blankets of lush sod crops. Winter grazing has been practiced only a few years on a large scale, but from this small and late beginning it has now grown into a full-scale movement in grassland farming. It should be understood as a part, perhaps the most valuable part, of the year-around pastures which are attracting the attention of agricultural leaders and writers, as well as the editorial writers of our daily newspapers.

Winter grazing is simply the establishment of combinations of small grains, grasses, and legumes during the late summer and early fall for grazing through the winter. Thus winter pastures in combination with the more common spring- and summer-grazing crops afford year-around pastures that are not only proving successful but also

[1] Chairman, Pasture Subcommittee of the Plant Food Research Committee of the National Fertilizer Association.

highly satisfactory to farmers. In fact the farmer with winter grazing is like the successful alfalfa grower, he will always take you to these fields to show you the appetizing forage and the good condition of his livestock. (If he has a prize herd of beef or dairy cattle on his lush winter grazing, you had better plan on spending the day with him!)

Now to get back to the "red hills" of the Piedmont, which extend from a point near Auburn, Alabama, northeastward through Georgia, South Carolina, North Carolina, and Virginia; we spent a week early this year on a 1,400-mile trip to see and study winter grazing, particularly in this area. It was a pleasant sight to view the green hillsides of north Georgia in late January, standing out in bold contrast to the bare fields being subjected to the ravages of winter rains. It is possible in this brief space to report only a few typical examples of the many farms and large acreages covered with green blankets of winter-grazing crops.

A father and son on Route 1, Laurens, South Carolina, T. P. and D. Eugene Brown, have demonstrated how a year-around grazing program may bring new prosperity to a farm family. For years they had been fighting a losing battle of holding their land, both as to title and soil fertility, through the accustomed practice of row cropping their red hill farm. Dairy farming and winter grazing are now winning the battle for them. As we approached the community under the guidance of C. B. Cannon, an outstanding county agent, the entire landscape was a pattern of green up the hillsides and down the valleys.

The motorcade, then numbering about 40 cars and approximately 100 people including neighboring farmers and business men of the towns around, drove off the paved highway into the middle of the Browns' farm, where the son began telling us his success story. He related how his father a number of years ago was forced to sell off part of his land to meet obligations, but after turning to dairying and winter grazing had not only regained all of his previous land but was buying land around him. During 1946 and 1947 the Browns had 30 acres of annual grazing and 40 acres of permanent pasture. In 1948 the annual grazing

Fig. 2. Members of the Winter-grazing Tour observing heavily grazed ladino clover-fescue pasture on the farm of Watson Morris, Mecklenburg county, North Carolina, January 1949.

was increased to 142 acres. At present they have 175 acres of annual grazing with 100 dairy cows, and are happy with their program.

Mr. Brown's recipe includes good land preparation, the use of lime, and 500 to 1,000 pounds per acre of commercial fertilizer such as 5-10-5 or 0-12-12 with ample seeding of combinations of barley, rye grass, and crimson clover, or fescue and ladino clover, or other combinations which include alfalfa. Last year a topdressing of nitrogen was applied in early November and grazing which was begun the middle of November has been continuous except for one or two days.

Here is an example of a farmer starting his grazing program with a small acreage and now successfully expanding it over most of his farm. Driving for several miles around this community convinced us that the Browns' neighbors also believe in winter grazing, for most of the farms had blankets of grass.

Many other farms with acreages of green grazing were seen throughout the Piedmont of South Carolina—in fact, H. A. Woodle, Extension Agronomist of Clemson, stated that the acreage in his State had increased from 40,000 acres in 1945 to approximately 400,000 in 1948-49.

There is no single combination of winter-grazing crops recommended, which was well illustrated by the program of C. T. Smith of Newberry County, South Carolina, who uses 8 different combinations of grazing crops for his 180 head of dairy cattle.

This farmer produces all of the feed used except cottonseed meal. The program on this farm was begun in 1932 and now all but 18 acres of his cropland is in feed or grazing crops. An unusual and interesting observation on Mr. Smith's farm was that he had at least 6 combinations of grazing crops and also alfalfa for hay or grazing as well as re-seeding crimson clover which is followed by grain sorghum. Some of these combinations have overlapping periods to provide insurance in case one combination fails. Surplus forage, especially in the late spring, is put up as silage for later use when needed.

Winter grazing is successful on small acreages as well as large. This was shown on 10 acres of row crop land in 1947 by J. M. Caldwell of Chester County, South Carolina. He applied 600 pounds of complete fertilizer per acre and seeded a mixture of 6 to 8 bushels of mixed oats, barley, and wheat, 20 pounds of crimson clover, and 20 pounds of rye grass the first of October. On November 10 he began grazing 12 head of dairy cattle continuously until the first of January, when they were taken off for topdressing with 200 pounds of nitrate of soda. The 12 head of cattle were put back on the 10 acres the middle of January and remained until the middle of March. The clover was allowed to seed and 1,000 pounds of seed were saved from 3 acres. Cattle were put back on and grazed for an additional 30 days.

This field was plowed last summer and winter-grazing crops were again established as described above. Ten head of cows were turned in on November 15 and have been on continuously except for a few days of heavy rainfall. As to the value of this winter grazing, Mr. Caldwell estimated his land fertility has increased 30 to 40 per cent. Milk yield has practically doubled, in addition to the cows picking up some weight and the daily savings on hay and grain.

Moving into North Carolina under the leadership of Sam Bobson, Pasture Specialist of the North Carolina Extension Service, we found a pattern similar to that seen in South Carolina except possibly more ladino clover and more alfalfa acreage. An outstanding example of a farm being converted over completely to grazing crops was the farm of Watson Morris of Mecklenberg County. Here were 100 acres of alfalfa in addition to the small grain-crimson clover, ladino clover-orchard grass, or

(*Turn to page* 47)

Fig. 1. A high-producing dairy herd on a high-producing ladino clover-grass irrigated pasture in Santa Clara county, California.

Why Use Potash on Pastures?

By M. E. McCollam

San Jose, California

THE question "Why use potash on pastures?" may well be asked in the West, where nitrogen fertilizer seldom fails to produce increased growth of grass, and phosphorus still further contributes to the volume of forage by greatly benefiting legumes such as the clovers and alfalfa.

The answer is, of course, that the increased production caused by nitrogen and phosphorus draws heavily on all of the nutrient elements of the soil. If any one of these nutrients is mined from the soil (for instance potash) because at first it apparently is not needed, sooner or later its scarcity will place a limit on the productive power of the soil. Replenishment will be necessary. Also, strangely enough, in the midst of a reputed abundance of potash in Western soils, we are finding as we actually become better informed, more and more cases of soil which probably was always deficient in the power to supply enough potash for the best production of certain crops.

There is a mistaken idea that in pasturing land, the land is thereby "rested" or improved. Very often the pasture crop is relegated to the poorer land on the farm, because pasturing is expected to improve it. The reason why pasture herbage is so highly regarded as a feed for livestock is that harvested in the immature state, it contains concentrated amounts of digestible nutrients and

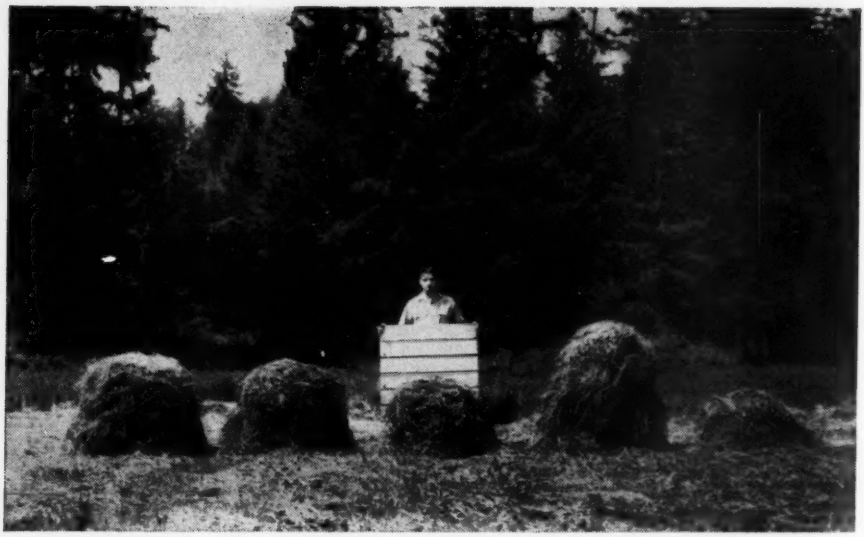


Fig. 2. First cutting on pasture plots in Western Washington. N. P. K. combination of 60-60-60 gave the highest yield of pasture dry matter—4,924 pounds compared to 2,002 on unfertilized plot.

minerals. This concentrated material draws continuously and heavily on the plant foods in the soil including large amounts of potash.

In a pasture experiment in Western Washington the unfertilized area, cut three times in the pasture stage, yielded 3,370 pounds pasture dry matter per acre. This withdrew from each acre 12 pounds of phosphoric acid (P_2O_5), 65 pounds of potash (K_2O), and 47 pounds of lime (CaO) from the soil. An area fertilized with nitrogen and phosphorus under the same treatment yielded 4,520 pounds pasture dry matter per acre. This withdrew from each acre 24 pounds of phosphoric acid (P_2O_5), 73 pounds of potash (K_2O), and 77 pounds of lime (CaO) from the soil.

Without the use of fertilizer in a good pasture management system, it may be suspected from the above figures that the pasture crop in many cases may become unproductive through soil impoverishment. The return of fertilizer by animals on the pasture in the form of manure helps to replenish the soil, but each year there is a net loss of potash. This has been well explained by Midgley and Varney in a previous article in this magazine entitled "Pot-

TABLE I.—YIELDS OF PASTURE DRY MATTER, POUNDS PER ACRE

Location	600# Superphosphate	200# Muriate of Potash 600# Superphosphate	Increase due to 200# Muriate of Potash
Bow, Wash. (2-yr. av.)	5,578	6,155	577
Eatonville, Wash., Location 1	3,082	4,077	995
Eatonville, Wash. (2-yr. av.) Location 2	7,268	8,766	1,498
Lynden, Wash. (2-yr. av.)	6,191	8,035	1,844
Snohomish, Wash. (2-yr. av.)	6,578	7,011	433
Shelton, Wash.	4,471	6,776	2,305

TABLE II.—YIELD OF PASTURE DRY MATTER, POUNDS PER ACRE

Location	125# Sul. of Ammonia 125# Treble Superphosphate	100# Muriate of Potash 125# Sul. of Ammonia 125# Treble Superphosphate	Increase due to 100# Muriate of Potash
Buckley, Wash., 1937	5,129	7,565	2,436
Buckley, Wash., 1938	11,361	15,651	4,290

ash Losses on the Dairy Farm."[1] It is stated that on an average dairy farm of 15 cows, where the supplemental grain feed is purchased, the net loss of potash is 195 pounds (K_2O) each year.

The American Potash Institute has been associated with much of the pasture fertilizer experimental work carried on in Western Washington. Here potash has proved to be of value in raising yields of pasture dry matter and in encouraging a balanced sod of grasses and legumes. In five series of fertilizer plots on pastures in four counties, as early as 1930 the value of potash in addition to phosphorus for fertilizing grass land was established, as the results in Table I show.

Again, in 1937, potash proved to be of great effectiveness in raising the yield of pasture dry matter on a newly seeded pasture at Buckley, Wash. Here the results for two years are shown in Table II.

[1] April, 1946. Rp. T-4-46.

In 1941, pasture experiments were continued at four more locations, and the results were again in favor of including potash, along with nitrogen and phosphorus in the pasture fertilizer program. The results are condensed here in Table III.

Because the dry matter of grass in the pasture stage (immature) is highly digestible and generally contains considerably more protein than alfalfa hay or wheat bran, it is not difficult to assign a dollar and cents value to this type of feed. Certainly *pasture dry matter* is worth as much as the concentrate feeds ordinarily fed to livestock, and a value of $50 per ton would be conservative. With this reasoning, it is readily seen that all of the increases in pasture dry matter here tabulated, due to using potash in the fertilizer treatment, have returned a profit over the cost of the potash.

Fertilizer treatment can greatly influence the kinds of plants making up

TABLE III.—YIELD OF PASTURE DRY MATTER, POUNDS PER ACRE

Location	200# Nitrate of Soda 150# Treble Superphosphate	100# Muriate of Potash 200# Nitrate of Soda 150# Treble Superphosphate	Increase due to 100# Muriate of Potash
Battleground, Wash.	3,324	4,193	869
Custer, Wash.	2,370	2,700	330
Ferndale, Wash. (2-yr. av.)	2,087	2,616	529
Kent, Wash. (2-yr. av.)	3,821	4,689	857

the pasture. Heavy use of nitrogen will increase the amount of grass and reduce the amount of clovers and other legumes. The mineral elements phosphorus, potassium, and calcium encourage the growth of clovers and other legumes, and if generously used as fertilizer will reduce the proportion of grasses in the pasture. A desirable proportion of grasses and clovers can be maintained in a pasture by balancing the use of the plant foods. Another striking effect of fertilizer is the control of certain weeds in pasture land, as in the case of dandelion here illustrated (Figure 3).

It should not be assumed that it is only necessary to use fertilizer to get high-yielding pastures. Management of the animals on pasture is very important, and usually a system of pasturing several relatively small pasture fields in a rotation plan is quite desirable.

A shortage of soil moisture cuts down the yield of pasturage very quickly, and the irrigation of pasture land is becoming a common procedure. Even in humid sections it has been found profitable to have irrigation equipment to water the pastures during periods in the summer when soil moisture becomes short. The effectiveness of fertilizer and water combined can be seen from the tabulation of results obtained at Western Washington Experiment Station. Fertilizer cannot exert its greatest benefit unless sufficient soil moisture is present.

In California, the establishment of irrigated pastures in conjunction with dairying and livestock raising has become a widespread undertaking, and acreage devoted to this crop has been increasing to imposing figures. One forage plant which has been going right along with this development is ladino clover. Its earliest extensive use in California was in the Oakdale district in the San Joaquin Valley, where it steadied a faltering agriculture and created the base for a prosperous community. Fertilizer was used to good advantage on these ladino pastures, this practice for many years being confined to superphosphate applications. Subsequent fertilizer experiments have shown that potash in addition to the phosphate treatment gives still greater yields of pasturage. Lime was also found to be a desirable part of the fer-

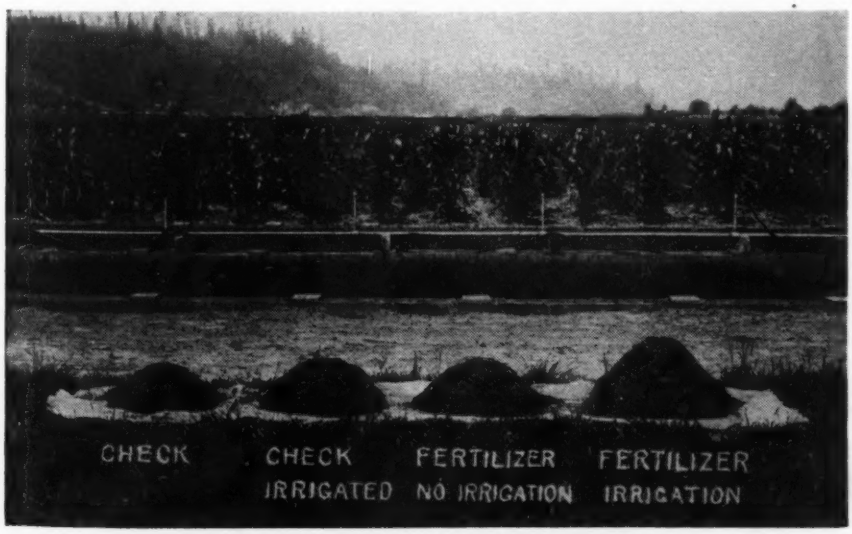
Fig. 3. Fertilizer treatment often discourages weed growth in pastures and brings in a strong growth of clovers and grasses. Left—no fertilizer. Right—a nitrogen and potash plot (60-0-60).

Fig. 4. Under frequent irrigation and generous fertilizer practice ladino clover looks like this in California's interior valleys.

tilizer treatment.

The possibilities in a phosphate-potash fertilizer combination can be seen in these results of field experiments at Oakdale, Calif.

Treatment	*Tons Green Weight per Acre*
No fertilizer	7.82
Phosphate	12.68
Phosphate-potash combined	17.05



FERTILIZER AND IRRIGATION PLOTS ON PASTURES

Without water and fertilizer... 368 Fertilized but without water... 589
Watered but not fertilized.... 594 Watered and fertilized..... 848

The figures are for cuttings taken on June 12 and represent about 2 weeks' growth of grass during an exceptionally dry period of weather. They show the favorable effect of sufficient soil moisture upon the yield of fertilized pastures during periods of dry weather.

Other field experiments with fertilizer on ladino clover at Galt, Calif., showed these results:

Treatment	*Tons Green Weight per Acre*
No fertilizer	25.07
Phosphate	27.42
Potash-phosphate combined	31.14
Potash-phosphate-lime combined	39.27

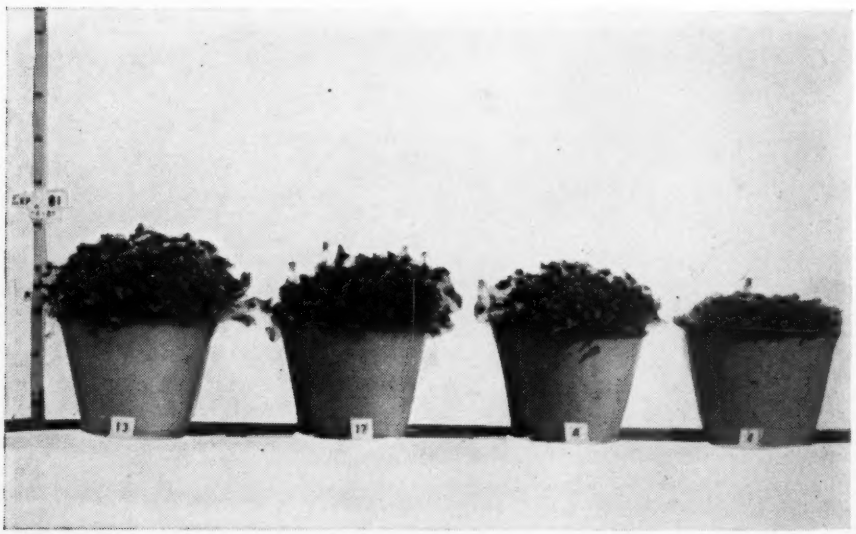
The use of phosphate, potash, and lime is considered a necessary basic treatment of pasture land over a wide area. By this treatment, the clovers and other legumes are benefited, which means higher yield and better quality of pasturage. The use of nitrogen is necessary, as well, to stimulate the growth of grasses and maintain a good proportion of these plants in the pasturage. Nitrogen may be used several times during the season to good advantage to stimulate growth of the pasturage, provided soil moisture is in good amount and the mineral plant foods are present to balance this effect.

On irrigated ladino clover pastures in San Joaquin Valley, Calif., a combination of phosphate, potash, and lime has produced the best yields of clover. The phosphorus may be supplied in the form of 200 pounds of superphosphate per acre, and potash either in the muriate or sulphate form should be applied at the same rate. Mixed fertilizer containing these two plant foods can also be obtained.

If an application of lime is made, 1,000 pounds per acre should be enough for two or three years. A lime application is most effective where worked into the soil prior to seeding new stands of clover. A certain proportion of grass is desirable in ladino clover pastures, and grasses are commonly seeded with the clover. Some nitrogen may be used in the fertilizer program to maintain a proportion of grass along with the clover.

In applying phosphate-potash fertilizers to irrigated pastures using the

(*Turn to page* 45)



BUCKET TESTS—LADINO CLOVER on San Joaquin loam soil, showing growth prior to third cutting. These bucket tests show the additional value of lime with the phosphate-potash combination.

LEFT TO RIGHT: (13) Phosphorus, Potash, and Lime Treatment—Yield green weight per acre 14.28 tons. (12) Phosphorus-Potash Treatment—Yield green weight per acre 11.14 tons. (4) Phosphorus Treatment—Yield green weight per acre 8.09 tons. (1) Untreated—Yield green weight per acre 4.11 tons.

Fig. 1. A group of farmers view a cantaloupe experiment during the Field Day at the Delaware Agricultural Substation.

Efficient Vegetable Production Calls for Soil Improvement

By E. P. Brasher

Horticulture Department, University of Delaware, Newark, Delaware

THERE are many ways to accomplish soil improvement. It may be done by supplying the land with water or by draining the land. The same feat can be accomplished by maintaining the limited amount of moisture in the soil; thus preventing run-off which carries away the topsoil as well as plant nutrients. It may also be done by the addition of fertilizer and organic matter or by the improvement of the physical condition of the soil. In Delaware the most feasible methods appear to be: (1) Application of fertilizer, (2) addition of organic matter, and (3) improvement of the physical condition of the soil. Only these three methods will, therefore, be discussed.

Before initiating soil improvement practices, it is desirable to know the type of soil that is to be improved—its depth, pH, and organic and mineral content. Soil fertility levels in Delaware are generally such that marked responses are obtained from applications of the major fertilizer elements. However, the balance of these elements is usually so delicate as to make it a

potential source of difficulty in the nutrition of crops. A recent study of Delaware soils conducted by the Agronomy and Agricultural Chemistry Departments revealed that they generally have a low exchange capacity and are low in nitrogen, available phosphorus, potassium, and possibly certain minor elements. The topsoil in the truck crop region is usually six to eight inches deep, the organic carbon content 0.5 to 1.0 per cent, and the pH from 4.8 to 6.0. The soils, for the most part, range from sand to sandy loam.

One of the most feasible means of measuring the improvement in soils is through crop yields. This method, therefore, will be employed to a large extent throughout this paper. Yields of tomatoes, lima beans, potatoes, and some of the cucurbits will be frequently cited since these crops are some of the most important vegetable crops grown in Delaware.

A Combination of Soil Improvement Practices

No one practice can be expected to restore the productivity of a poor soil in a short period of time. It usually requires a combination of good practices. This combination may consist of adequate fertilization, liming, the use of manures or cover crops, and good cultural practices.

It is well known that the roots of most vegetable crops will not penetrate to a great depth in a subsoil which contains only a small amount of available plant food and has a pH of 4.5 or lower. Vast areas of soils in Delaware are in this category. Since some of these soils do not have over six inches of topsoil, the crops grown thereon are easy prey to droughts. When the root growth of a crop is largely restricted to six inches and that crop is grown without irrigation, moisture is likely to be the limiting factor. On deeper soils or soils which have a more desirable subsoil for root penetration, moisture is not so apt to be deficient. Shallow soils with undesirable subsoil can be greatly improved within a few years by employing the combination of practices listed above. The fertilizer and lime should be plowed down as deep as soil conditions will permit. If manures are used, they also should be plowed down. One cover crop, preferably a legume, should be turned under each year. This crop can be grown in addition to a cash crop. By following these practices, a great improvement may not be noticeable the first year; but as the years pass, the root growth will gradually penetrate deeper and a definite improvement in productivity will become evident.

In 1942, the Delaware Agricultural Experiment Station purchased a neglected farm in Sussex County for an Agricultural Substation. At the time of purchase, only inferior yields of crops could be obtained. Now, however, after following the practices of plowing under fertilizer, lime, cover crops, and poultry manure, large yields of most crops are obtained. In 1947, such yields per acre as 17 tons of tomatoes, 5 tons of sweet corn, 12 tons of watermelons, and 10,000 cantaloups were obtained. Under identical conditions, except for the soil, it is believed that the yields of these crops in 1943 would have been only a fraction of those of 1947.

Fertilization

Few, if any, topics on the production of vegetable crops have received as much attention as fertilization. This has been necessary because of the complexity of the problem. Soil fertility tests have been of value in determining fertilization practices but they are not the sole solution.

In a study of soils from productive and less productive tomato fields in Kent County during 1941, some striking relationships between the soil content and yields were revealed. When yields from soils containing varying amounts of organic carbon were compared, there was revealed a substantial difference in favor of the higher or-

ganic carbon content. Likewise, a high nitrate-nitrogen content increased the yields greatly over a medium nitrate-nitrogen content. Soils containing a medium supply of potassium also produced greater yields than soils containing less potassium. In the case of phosphorus, however, those soils containing the least amount produced the greatest yields. With magnesium, the reverse was true. Soils with a pH of less than 5.8 produced more tomatoes than those with a pH above 5.8. This same study was duplicated in 1942, but the results with phosphorus, magnesium, and pH were exactly opposite from those of 1941. Approximately 240 acres of tomatoes in 50 fields were represented in this study.

If conclusions from this work had to be drawn, it would be necessary to conclude that the art of soil testing, alone, could not be relied upon to determine the most satisfactory soil fertility level for the production of tomatoes in Kent County, Delaware. Perhaps tissue testing or a combination of tissue and soil testing would be more desirable in solving fertilization problems. Certainly, tissue testing would be a valuable tool if criteria were established to indicate what is an adequate or optimum amount of nutrients in a given plant.

Fertilizer Rates

The present per-acre rate of fertilizer for vegetable crops grown in Delaware lags far behind that of the most economical. It is estimated that the average farmer in Delaware applies 700 pounds for tomatoes, 500 for potatoes, 400 for lima beans, 200 for sweet corn, and 500 for muskmelons. According to the Delaware Agricultural Experiment Station's recommendations, all of these crops could use economically much more fertilizer. How much more will depend upon a number of factors, such as soil, rainfall, temperature, cultural practices, etc.

In a test (Table I) in 1947 the yields of three out of nine vegetable crops (sweet corn, muskmelon, and squash) were significantly increased when the fertilizer application was increased from 1,500 to 3,000 pounds of a 4-8-12 fertilizer per acre. Of these increases, however, only one, that of muskmelon, was economical. This supports pre-

Fig. 2. This lima bean crop was preceded by a cover crop that was plowed under. Five tons of poultry manure were broadcast after plowing, and 500 pounds of 5-10-15 per acre were banded at planting time.

vious work at the Delaware Station in that it is rarely profitable to apply more than 1,500 pounds per acre of a 20 or more unit fertilizer to any vegetable crop. In most cases, even this amount is too much for economical returns.

Fertilizer Ratio

It is rather simple to calculate the amount of each fertilizer element necessary to produce a good yield of any vegetable crop. It is not so simple, however, to determine the proper ratio for that crop. In the past, fertilizer ratio recommendations have been based largely on experimental evidence obtained by testing various ratios in the field. Sound recommendations have been established by this procedure but there is always some doubt as to the value of any ratio when it is used under conditions where it has not been tested.

In Delaware it appears that some crops are more exacting in their ratio requirements than others. Tomatoes for example seem to thrive efficiently on a number of different ratios. During the period from 1942 to 1944, inclusive, ten different ratios were tested. At the conclusion of this study, there was no significant difference in yield between any of the ratios. On the other hand, in an experiment with Irish potatoes a 1-2-3 (5-10-15) ratio was outstanding for three consecutive years. This same ratio was particularly good in the production of asparagus, lima beans, and muskmelons.

A faster and more reliable method of determining nutrient requirements for plants under a given set of conditions is badly needed. A start has been made toward finding this method. At present, horticulturists and agronomists in widely separated areas of the United States are pooling their research data to expedite the work in determining the optimum content of nutrients in crops.

Poultry Manure

According to results obtained at the Delaware Agricultural Experiment Station, the vegetable growers who have access to poultry manure and fail to use it are missing the opportunity of producing maximum yields. An extensive study with the use of poultry manure in the production of tomatoes, lima beans, and asparagus has revealed that greater yields of these crops can be obtained with a combination of poultry manure and commercial fertilizer than with commercial fertilizer alone. By substituting five tons of poultry manure for one-half of a good application of commercial fertilizer, yield increases of 2.2 tons of tomatoes, 351 pounds of shelled lima beans, and 123 pounds of asparagus per acre resulted. Further studies also indicated that chicken manure could be successfully substituted for horse manure in the production of cantaloupes and watermelons. In this case, however, it was necessary to apply the chicken manure to the cover crop in the fall before planting the cantaloupes and watermelons the following spring.

TABLE I. THE EFFECTS OF FERTILIZER RATES ON THE YIELDS OF NINE VEGETABLE CROPS, GEORGETOWN, 1947

Treatment per acre	Tomato, tons per acre	Potato, bus. per acre	Sweet Corn, tons per acre	Broccoli, lbs. per acre	Cabbage, tons per acre	Sweet Potato, bus. per acre	Watermelon, tons per acre	Muskmelon, tons per acre	Squash, tons per acre
No fertilizer.....	9.67	151	3.11	1,213	2.33	140	6.91	6.35	3.32
1,500 lbs. 4–8–12...	14.33	190	4.15	2,054	4.36	257	11.11	9.32	4.93
3,000 lbs. 4–8–12...	14.10	199	5.19	2,582	5.86	257	11.24	12.39	7.24
L.S.D.....	1.90	31	0.84	1,213	1.60	31	2.43	2.01	0.81

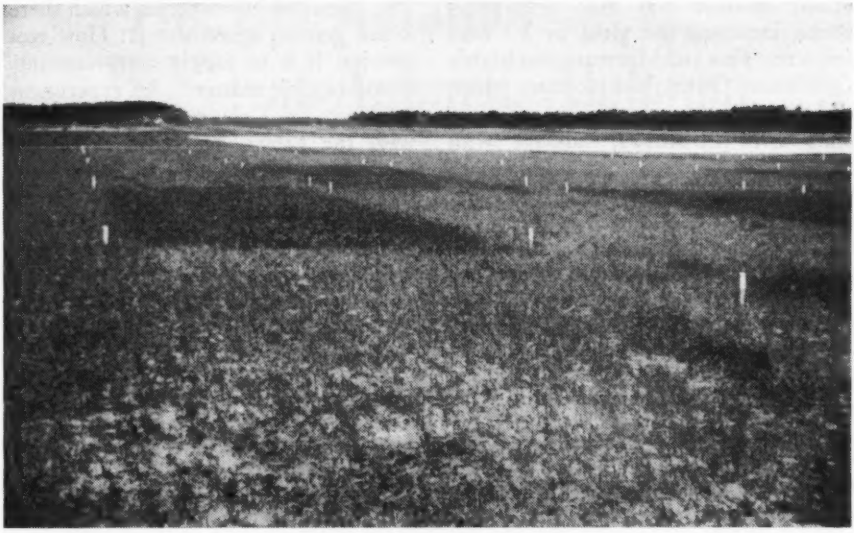


Fig. 3. Checker board effect in rye cover crop produced by fall application of poultry manure. Photograph was made in early spring.

The National Committee on Fertilizer Applications is performing an excellent service to experimental workers in the fields of horticulture and agronomy. Through its efforts, large volumes of scientific information of inestimable worth have been collected and published. This information will, no doubt, have far-reaching effects in promoting better fertilizer placement practices in the production of vegetable crops.

Fertilizer Placement

In recent years, fertilizer placement studies with vegetable crops in Delaware have been confined to tomatoes, potatoes, lima beans, and asparagus. Results after three years of study with tomatoes, potatoes, and lima beans, and one year with asparagus showed that broadcasting the fertilizer on the soil surface and then plowing it down was the superior method of applying tomato fertilizer when a starter solution was used. The band method was best with potatoes and lima beans; while with young asparagus, it was best to apply the fertilizer in a band 18 inches wide over the top of the row. Seven different methods were tested with tomatoes and four each with potatoes, lima beans, and asparagus.

Minor Elements

The increased incidence of nutrient disturbances in vegetable crops on the Coastal Plain soils of Delaware has made it necessary to initiate studies with minor elements. An exploratory experiment was, therefore, designed in 1947 to reveal information which might be of value in further investigations. Some of the results were so striking that they are presented herein. The treatments together with the crops studied and their respective yields are presented in Table II.

Of the nine vegetable crops tested, several responded to one or more of the minor elements. Tomatoes, potatoes, cabbage, and squash produced significantly greater yields when 20 pounds of borax were applied per acre. Only cabbage and squash responded to magnesium. Potatoes, cabbage, and squash responded to copper. When Es-Min-El was used tomato, potato, cabbage, and squash yields were increased significantly. One of the most phenomenal yield increases due to a

minor element was that of tomato. Boron increased the yield by 3.3 tons per acre. This yield increase was highly significant. Other yield increases which also were highly significant are: Tomato with Es-Min-El; cabbage with copper and with boron; and squash with Es-Min-El, with magnesium, and with copper. None of the minor elements, at the rates used, resulted in a significant yield reduction.

During the growing seasons all nine vegetable crops were checked for deficiency symptoms but in no case could a clear-cut boron, magnesium, or copper deficiency symptom be detected on the check plots. The plants were, therefore, obtaining enough of these elements to sustain normal growth but not enough in some cases, to produce optimum yields.

Since this study was conducted in a single season on only one soil type, the results although significant should not be considered conclusive. However, they may have value in determining the vegetable crops that are apt to respond to minor elements on coastal plain soils.

Organic Matter

There is general agreement among agricultural workers on the value of organic matter in the soil. Since this is true, there is no need in discussing obvious benefits of organic matter here. One question, however, on which there is not general agreement is: How economical is it to supply extra amounts of soil organic matter? An experiment at Wyoming, Delaware, in cooperation with the Libby, McNeill, and Libby Company was designed to answer this question in connection with tomato production. This experiment was only initiated in 1946; so the results to date are very meager and insignificant. Some of the consistent trends, however, indicate that:

1. Nutrients cannot be economically fed to tomato plants through the cover crop.
2. As the period of time before applying fertilizer decreased, tomato yields increased.
3. The aerial tonnage of cover crops produced from spring fertilization was greater than that produced from fall fertilization.
4. Legume cover crops were more effective in increasing tomato yields than non-legume cover crops.
5. When no fertilizer was involved, it was economically sound to precede the tomato crop with a vetch or a combination of a rye and vetch cover crop.
6. When 1,200 pounds of a 5-10-10 fertilizer were applied immediately before plowing in the spring, it was economically unsound to precede the tomato crop with any cover crop tested.

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TABLE II. EFFECTS OF MINOR ELEMENTS ON THE MARKETABLE YIELD OF NINE VEGETABLE CROPS, GEORGETOWN, DELAWARE, 1947

Treatment per acre	Tomato, tons per acre	Potato, bus. per acre	Sweet Corn, tons per acre	Broccoli, lbs. per acre	Cabbage, tons per acre	Sweet Potato, bus. per acre	Watermelon, tons per acre	Muskmelon, tons per acre	Squash, tons per acre
1,500 lbs. 4-8-12...	14.33	190	4.15	2,054	4.36	257	11.11	9.32	4.93
1,500 lbs. 4–8–12+ 20 lbs. Borax....	17.63	249	4.77	2,178	6.64	238	11.60	11.17	5.99
1,500 lbs. 4–8–12+ 50 lbs. $MgSO_4$...	14.63	199	4.72	1,805	6.27	263	10.60	9.94	6.72
1,500 lbs. 4–8–12+ 50 lbs. $CuSO_4$....	15.97	226	4.98	2,240	6.85	230	11.92	10.10	7.62
1,500 lbs. 4–8–12+ 50 lbs. Es-Min-El	17.00	229	4.67	2,645	6.53	251	12.87	10.33	6.78
L.S.D.—5%.....	1.90	31	0.84	1,213	1.60	31	2.43	2.01	0.81
L.S.D.—1%.....	2.66	44	1.14	1,711	2.25	44	3.41	2.83	1.13

The Old Rotation at Auburn, Alabama

By Franklin L. Davis[1]

Alabama Polytechnic Institute, Auburn, Alabama

THE Old Rotation at Auburn, Alabama, is probably the oldest field experiment in the United States in which cotton has been grown. Started in 1896 by the late J. F. Duggar it has been conducted continuously since that time by the Agricultural Experiment Station. Because only minor changes have been made in the cropping system, the record of the fertilizer used and of the yields obtained provides considerable information on the fundamental problem of maintaining soil fertility in the South.

The cropping plan and the changes that have been made in the crops grown are shown in Table I. Vetch was substituted for crimson clover as the winter legume after only three years. Beginning in 1925, the cowpeas in the plots on which corn and cowpeas were interplanted were dropped and vetch was used to replace them. At the same time vetch was also introduced into the 2-year (plots 5 and 9) and the 3-year (plots 10, 11, and 12) rotations following cowpeas. The only change in the major crops grown has been the change from corn and legumes continuously and corn alone continuously on plots 1 and 2 to cotton alone continuously. This was done because the corn yields represented relatively low returns in comparison to those obtained from cotton. The subsequent yields of the cotton have given an excellent measure of the effect of the accumulated legume residue on plot 1.

The total amount of phosphate and potash applied to each plot has been the same for the entire period that the experiment has run. Although the amounts applied each year have been changed a few times, the amount applied any one year has always been the same. The changes in the amounts of phosphate and potash used were made to meet obvious fertility needs. Consequently, they are given in full.

From 1896 to 1920, inclusively, all plots received annually 160 lbs. per acre of 14% P_2O_5 acid phosphate and 160 lbs. per acre of kainit (12% K_2O). These were applied in the spring before planting summer crops. No nitrogen fertilizers were used.

Fertilizer Changes Made

The first change in fertilizer applications was made in the fall of 1921. To quote from the record for that year, "To increase the available phosphorus for the legumes and main crops, 400 lbs. per acre of 16% superphosphate were applied to the west half of each plot before seeding to vetch." This was repeated in the fall of 1922. In the spring of 1923, 800 lbs. per acre of 16% superphosphate were applied broadcast to the east half of all plots. Beginning in the fall of 1923, 400 lbs. per acre of 16% superphosphate were applied to the entire areas of *all* plots. Thus, from 1924 to 1931, inclusively, 400 lbs. per acre of 16% superphosphate were applied in the fall to all plots

[1] Manuscript prepared by Franklin L. Davis, Soil Chemist. Members of the staff of the Department of Agronomy, Alabama Experiment Station, have at different times planned the experiment and the changes made. Much of the work in conducting it has been done by the following: J. F. Duggar, E. F. Cauthen, H. B. Tisdale, E. L. Mayton, and D. G. Sturkie.

planted to oats or winter legumes. One hundred sixty pounds per acre of 16% superphosphate and 160 lbs. per acre of kainit were applied to all plots in the spring. In addition, 400 lbs. per acre of 16% superphosphate were applied to those plots that did not receive it in the fall.

In 1932 a change was made from kainit to muriate of potash and nitrogen was added as a topdressing for oats. Thus, from 1932 to 1943, inclusively, the fertilizer applications were the same as before except that 38.4 lbs. per acre of 50% muriate of potash were used instead of 160 lbs. of 12% kainit and the oats on plots 10, 11, and 12 were topdressed with 200 lbs. per acre of nitrate of soda each spring beginning in 1933.

Since 1944 all plots except No. 13, which gets 50 lbs. of 60% KCl in a 2-year period, have received annually 400 lbs. per acre of 18% superphosphate and 100 lbs. per acre of 60% muriate of potash. All plots on which winter cover crops are grown, except plot 8, receive half of the fertilizer before oats or winter legumes. On plot 8 all fertilizers are applied before cotton in the spring.

Maintaining Fertility

The yields of corn, cotton, and oats and the record of the fertilizers used throw considerable light on the problem of maintaining soil fertility. Of primary interest is the small but gradual decline in yields of both corn and cotton during the early years of the experiment. This decline was due to the small amount of growth made by the winter legumes. One hundred sixty pounds per acre of 14% acid phosphate applied annually to the summer crops did not provide sufficient phosphorus for the winter legumes. When 400 lbs. per acre of 16% superphosphate were applied in the fall, the vetch immediately began to make good growth and

TABLE I.—CROPPING SYSTEM USED ON THE OLD ROTATION, AUBURN, ALABAMA.

Plot	1896–1924	1925–1931	1932–1948
1	Corn and cowpeas continuously	Corn-vetch continuously	Cotton continuously Legume residue
2	Corn alone continuously	Corn alone continuously	Cotton continuously No Legumes
3	Cotton continuously Vetch [1]	Cotton-vetch continuously	Cotton-vetch continuously
4 & 7	2-yr. rotation Cotton-vetch [1] Corn and cowpeas	Cotton-vetch Corn-vetch	Cotton-vetch Corn-vetch
5 & 9	2-yr. rotation Cotton-vetch [1] Cowpeas	Cotton-vetch Cowpea hay-vetch	Cotton-vetch Cowpea hay-vetch
6	Cotton alone continuously	Cotton alone continuously	Cotton alone continuously
8	Cotton continuously Vetch [1]	Cotton-vetch Same as No. 3	Cotton-vetch continuously
10 11 12	3-yr. rotation Cotton-vetch [1] Corn and cowpeas Oats followed by cowpeas	Cotton-vetch Corn followed by oats Cowpea hay-vetch	Cotton-vetch Corn followed by oats Cowpea hay-vetch
13	2-yr. rotation on single plot Cowpeas Cotton-vetch [1]	Cotton-vetch Cowpea hay-vetch	Cotton-vetch Cowpea hay-vetch

[1] Crimson clover was planted until the fall of 1899.

TABLE II.—SUMMARY OF CORN, COTTON, AND OAT YIELDS ON THE OLD ROTATION.

Plot No.	Cropping System	10-yr. Av.[1] 1896–1905	10-yr. Av.[1] 1906–1915	4-yr. Av. 1920–1923	3-yr. Av.[2] 1924–1927	4-yr. Av. 1928–1931	4-yr. Av. 1932–1935	4-yr. Av. 1936–1939	4-yr. Av. 1940–1943	4-yr. Av. 1944–1947
	Corn Yields—Bushels per Acre									
1	Corn and Legumes continuously[4]	19.2	16.2	17.5	19.8	26.1	.....	.....	.....	.....
2	Corn alone continuously[4]	17.1	10.2	8.4	10.2	9.8	.....	.....	.....	.....
4 7	Corn and Legumes Cotton and Vetch	17.9	13.1	14.1	17.6	31.8	28.7	28.5	40.3	34.8
10 11 12	Cotton and Vetch Corn and Peas Oats and Peas	14.0	12.6	14.5	22.0	28.2	33.0	30.0	41.4	41.9
	Cotton Yields—Lbs. Seed Cotton per Acre									
1	Cotton continuously Legume residue	.....	.....	.....	.....	.....	1,395	1,143	723	470
2	Cotton continuously No Legumes ever	.....	.....	.....	.....	.....	563	574	334	288
3 8	Cotton and Vetch continuously	813	678	575	1,188	976	1,296 1,289[3]	1,329 1,336[3]	1,152 1,111[3]	1,070 1,064[3]
4 7	Corn and Vetch Cotton and Vetch	820	751	628	1,402	1,017	1,442	1,487	1,367	1,398
5 9	Cotton and Vetch Peas and Vetch	890	958	1,061	1,466	953	1,305	1,281	1,054	1,162
6	Cotton continuously No Legumes	803	573	308	492	502	528	495	430	242
	Oat Yields—Bushels per Acre									
10	Cotton and Vetch	737	804	591	1,139	905	1,403	1,286	972	1,125
11 12	Corn and Peas Oats and Peas	16.8	22.4	12.3	28.7	20.2	64.3	68.6	55.0	54.1

[1] Yield records for 1896 to 1919 lost in fire; records for 1896 to 1915 recovered.
[2] No corn or cotton harvested in 1925 due to drought; these data are 3-year averages.
[3] All phosphate applied to cotton, plot 8, from 1932-1943.
[4] Changed to continuous cotton, no legumes in 1932.

adequate tonnage of green matter. The subsequent yields of both corn and cotton, i. e. after 1923, show the effects of the increased growth of the winter legumes.

It is especially interesting to note that approximately a bale per acre of cotton has been produced on the corn-cotton rotation (plots 4 and 7) when vetch was grown each winter. This rotation also has produced fair corn yields, an average of 30.3 bushels per acre for the last 24-year period was obtained. The continuous cotton followed by vetch each year (plots 3 and 8) shows an average yield for the 24-year period of 1,181 lbs. per acre of seed cotton as compared to an average of 1,352 lbs. per acre from the cotton in rotation with corn. Obviously the yield of cotton is improved by rotation with corn. These yields have been made without any commercial nitrogen fertilizer. One can only speculate as to how much they might have been increased by side-

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A Hoosier Dynasty of Good Farmers

By C. W. Gee

Soil Conservation Service, Milwaukee, Wisconsin

THE rich, black soil of western Indiana has been good to the Foster family, and they in turn have been good to the soil. No one but a Foster has ever tilled their farm near Attica. And, since the first of their forefathers broke out the virgin sod 123 years ago, seven generations of the same family have called it theirs.

A heritage of good husbandry has been passed down with the farm from father to son. For generations, not a stalk of stubble nor any other crop residue has been burned. When the first red clover was introduced in the Midwest, the Fosters began growing it and by 1875, clover was one of their principal crops. When lime and commercial fertilizers came into use, the Fosters were the first to adopt them.

This is why J. Lee Foster and his stalwart son, Paul, are producing 145-bushel corn today on land which has been tilled since the days of John Quincy Adams. They are raising better crops than any Foster before them, not alone because of better seed, equipment, and improved methods, but because the land is just as rich today as it was a century ago, perhaps richer. The Fosters have found a sure road to a permanent American agriculture.

First of all the Indiana Fosters was Benjamin, who was the great, great, great, great grandfather of young Colin, least of the Fosters. Colin, now five years old, represents the seventh generation.

As might be expected, little is known today of Benjamin Foster except that he bought the farm from the government in 1825. Benjamin was a minister's son and lived in Madison county, Ohio. His choice of the Indiana farm was a wise one. With the exception of 60 acres of rolling land on the north side, the 220-acre farm lies as level as a table top.

The bulk of it is Wea silt loam, a prairie soil, black and rich in organic matter. Underlaid with gravel, the land is well drained, and fertile topsoil on most of it is three feet deep.

Shortly after Benjamin bought the farm, his son, James, loaded his young wife and baby into a covered wagon and began the long overland journey to the Shawnee Indian country of Indiana. Reaching the new farm, James moved his family into an abandoned cabin until a log house could be constructed.

But before he had had time to start opening the tough prairie bluestem sod with a breaking plow, his team strayed away. Young Mrs. James Foster and her baby remained by themselves in the cabin, deep in the heart of the Indian country, while her husband trailed his horses to Ohio and brought them back.

This is only a vignette in Foster family history but it indicates the tough, self-reliant stock from which the present generation sprang.

Four years after he had bought the farm from the government, Benjamin Foster deeded it to his son. By this time, James must have had a portion of the land under cultivation, and still more of the prairie sod went under the

breaking plow before he died in 1845.

For a time the land was operated under a guardian's management since not all of the heirs had reached their majority. Then, in 1853, the eldest son, John, bought out the other heirs and the farm welcomed the third generation of Fosters.

Until this point is reached in the family history, little is known about how the land was treated. But evidence that the earliest Fosters were also good farmers was there in the still fertile soil that rolled back from John Foster's plowshare prior to the Civil War. J. Lee Foster, present owner, can remember as a boy how he watched his grandfather work down the fields into a smooth seedbed by dragging the top of a crabapple tree over the plowed ground.

Not only was John Foster a good farmer who plowed under the stubble and diversified with grain and livestock, but he was also a resourceful one. A market for farm produce was still a question in that day because the country was only thinly settled and roads to the towns were little more than trails.

Working out his own solution to this problem, John Foster became his own processing and transportation system. He ground his own grain, butchered his fat hogs, packing them into casks of brine and then cut his own hardwood timber for a raft.

Loading his raft with flour, cornmeal, and pork, he floated it down the Wabash river until he reached New Orleans where he sold his produce including timber from the raft and returned home, his pockets jingling with silver dollars.

In 1875, John's son, George Foster, took over the management of the farm and became owner when his father died about 30 years later.

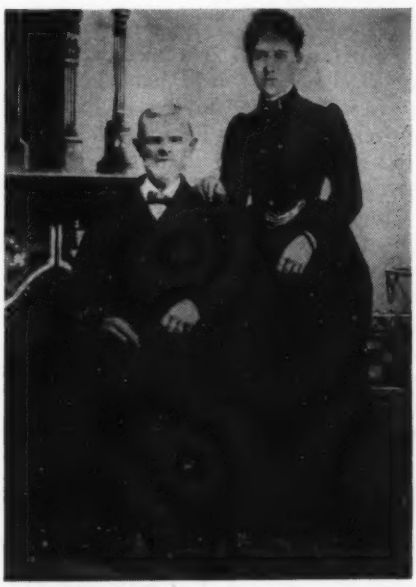
George Foster was ahead of his time. In this era, he would be called a good conservation farmer. In his day, he was regarded as a "clover crank" who believed that burning off stubble from a field was a mortal sin.

While others were following corn with corn, George Foster practiced his own ideas of crop rotation. He used a four-year rotation of corn, oats, wheat, and clover. In drouth years his land often produced yields double that of other farmers who laughed at the idea of plowing under straw and growing legumes.

Clover was his principal crop and his income came from the sale of seed and the sale of beef cattle. During all the years George Foster worked the farm, every scrap of stubble was plowed under. Every bit of manure went back on the land.

While his neighbors looked on wonderingly, George Foster with his walking plow turned under the red clover and a big English variety which was available in those years. J. Lee Foster and his brothers followed down their father's furrow with sticks, poking under clover which the plow failed to cover.

"I remember one dry year when most corn was a failure," J. Lee Foster



The farm welcomed the third generation of Fosters when John and his wife took over its management in 1853.

recalls. "Father's corn made 50 bushels to the acre on land that had been in clover the year before. He used to say if there was enough rain to get the crop up in good shape, his ground would raise a crop without another drop of rain."

This kind of husbandry is responsible for the fact that J. Lee Foster today doubles the corn yields of his father. For J. Lee Foster has heavy-yielding hybrids, good commercial fertilizers, and efficient farming equipment to use on land which is still highly productive.

As old age crept up on George Foster, his son took over management of the farm in 1903. A few years before his death in 1922, George passed the farm and his tradition of good husbandry down to the fifth generation.

J. Lee Foster followed in the footsteps of his father. He used a four-year rotation of corn, oats, wheat, and clover. And, he produced all the feed he needed for hogs and beef cattle which were then his principal income.

Ahead of Times

As early as 1912 he was spreading lime on his land. No spreaders were yet available and so he hauled lime in a wagon and spread it with a scoop shovel. As a result he grew one of the first good crops of alfalfa to be found in Fountain county.

Since then the entire farm has been limed regularly with never less than two tons to the acre being applied every four or five years. Heavy applications of fertilizer are also a standard practice. As a sample, in 1948 the land received 400 pounds to the acre of 8-8-8 fertilizer which J. Lee Foster and his son, Paul, plowed under with the sweet clover. In addition, 150 pounds per acre of 0-20-20 were drilled in the row on corn that same season and a like amount of 3-18-9 for oats.

Because the land is level, with deep, productive topsoil, J. Lee Foster and Paul, who has been in partnership with his father since 1937, are able to use shorter and more intensive crop rotations than are generally recommended. Their basic rotation is corn, oats, and sweet clover.

In 1948 the certified Clinton 59 oats yielded 60 bushels to the acre. Corn varieties were two yellow hybrids, U. S. 13 and Indiana 605. Besides the corn and oat land, the farm includes three 14-acre fields which are in a corn-oat-clover rotation. This is rotation pasture for poultry.

The north 60 acres which include all the rolling land on the farm have been developed as permanent pasture. Twelve acres of this have a four-year-old stand of birdsfoot trefoil. The remainder of the pasture is a mixture of alfalfa and bluegrass and a mixture of birdsfoot trefoil with bluegrass.

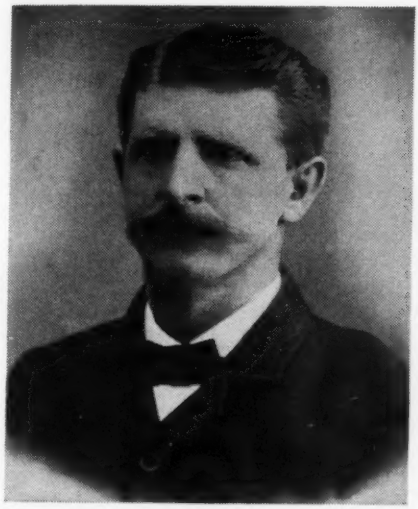
The principal income of the Foster farm today comes from a herd of registered Aberdeen Angus cattle and from poultry. The only grain crops of any kind which are sold are surplus and above their livestock requirements.

Surplus Buys Fertilizer

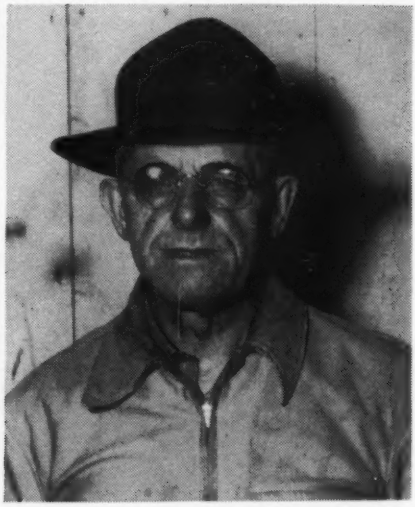
"Right now," J. Lee Foster says, "it looks like we will never feed up all our corn. However, we make a practice of selling surplus crops and using the proceeds to buy fertilizer which goes back into the land, poultry feed, and supplement."

The Foster poultry venture is no mere farm sideline. Starting in 1913, J. Lee Foster developed his flock as an important source of farm income. Then, in 1920 he attended a poultry short course at Purdue University and came home full of new and better ideas. This short course started him to keeping farm accounts which he has since maintained continuously. It also convinced him his poultry business should be expanded.

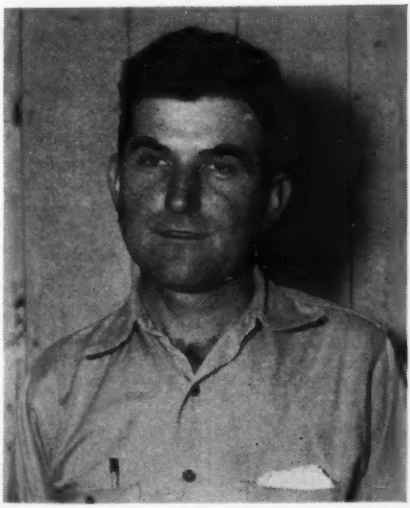
Today the Fosters carry 2,000 white leghorn laying hens through the winter. They buy sexed chicks from trapnested stock, and raise them on clean ground, utilizing the ladino rotation



George Foster who succeeded to the farm in 1875 was a soil conservation farmer two generations ahead of his day.



J. Lee Foster, fifth generation, has used modern technical advances to double corn yields of his forefathers.



Paul Foster, sixth of the line, follows the fine traditions of those who tilled the land before him.

Young Colin Foster of the seventh generation will one day carry on the tradition of good husbandry.

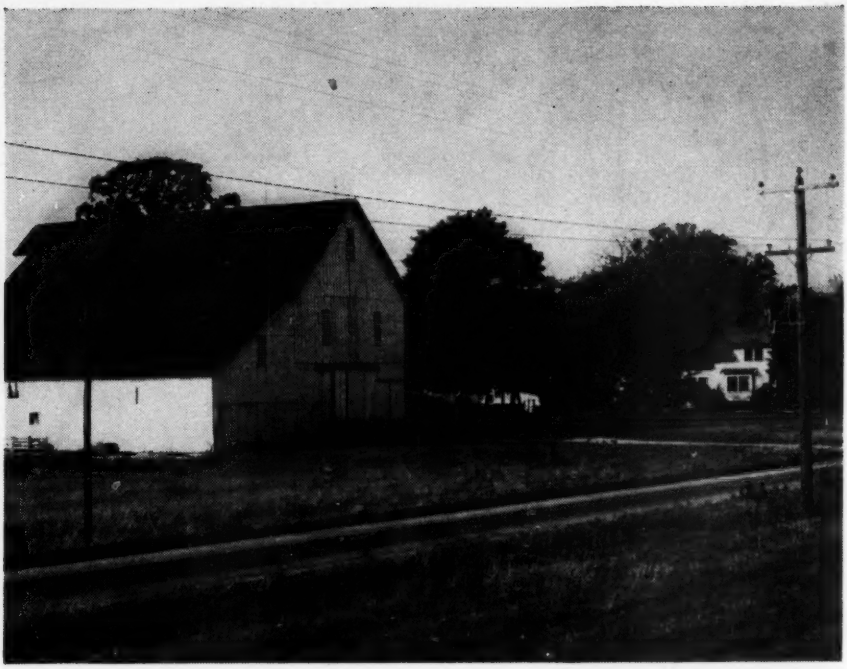
pastures. The hens are kept for one laying season.

Nothing is overlooked in modern poultry management. In the laying houses, all hens are de-beaked and all equipment represents the best yet devised. Some of it, such as the nests, was developed by J. Lee Foster himself who is no mean hand as an inventor and all around mechanic.

In addition, Mr. Foster built an automatic egg grader largely on his own design and later added a cooler and humidifier which he built by Purdue specifications. These added one cent a dozen to the price he receives for eggs. At peak production the flock turns out from 25 to 28 cases a week which the Fosters truck to Versailles, Ohio, and sell on a quality market.

They began their registered Aber-

(*Turn to page* 44)



Above: **The J. Lee Foster home near Attica, Indiana, reflects good living from well-kept soil.**

Below: **Back of his father's house, Paul Foster has built a snug, white bungalow.**

Above: **Only a few years ago this grass waterway where J. Lee Foster stands was a raw gully.**

Below: **Some of the best Angus families are represented in the Foster foundation herd.**

Left: J. Lee Foster inspects hybrid corn which yielded 145 bushels to the acre.

Below: Modern poultry methods provide eggs to be sold on a quality market.

The Editors Talk

Pasture Progress

Backed by all the major agricultural agencies, the fertilized pasture still forges ahead. While this applies to all agricultural areas, it has special significance in the South where diversification away from cotton increasingly has been recognized as of fundamental importance to the economy of that great agricultural area. This means diversion to livestock, which only a few years ago was regarded as an impracticable proposition. Now with the fertilized grass-legume pasture as a substitute for the broomsedge ranges, it has been widely and convincingly demonstrated that a livestock industry meeting every economic requirement is entirely feasible.

Starting with scientific research and experimentation, followed by widespread demonstration, it now has become a major activity of the educational forces to bring the pasture story to the individual attention of the millions of farmers, large and small, who stand to benefit from the information now available. To this educational enterprise many noteworthy contributions are constantly being made, among the more recent of which are two meriting special mention.

First, lately from the press is "The Pasture Book," a veritable handbook for the farmer who would like to have a fertilized pasture of his own and for the consultant guiding him in obtaining it. The author is that indefatigable pasture enthusiast, W. R. Thompson, Mississippi Extension Service's well-known agronomist. Here is a book written in plain language that any farmer can understand—concise, well-illustrated, and containing all the essential information that the farmer needs in launching and maintaining his pasture program. It is based on the author's own personal observations during eight years of field work in the State, two years' study of pasture research in twelve other Southern States, and discussions with the men in the South who know most about plants, soils, fertilizers, machinery, weed control, management, and other pasture problems. The statements therefore are authoritative, certainly as they pertain to Mississippi conditions, with fundamental principles pertinent far beyond this State's boundaries.

Second, a companion piece, so to speak, is the motion picture, "Twelve Months Green," prepared and distributed by the Southern Educational Film Production Service of Athens, Georgia. As its title indicates, this film portrays that outstanding feature of the Southern livestock program, namely, winter grazing. Again based on research and demonstration, the agronomists have devised combinations and rotations of legumes, grasses, and small grains which adequately fertilized provide twelve months of grazing. As the result, one traveling through the rural South is shown with pride herds of fine cattle with the remark that sounds like a boast—"those animals haven't been in a barn for twelve months!"

It is the "Twelve Months Green" aspect of the Southern pasture program that affords economic advantages immediately recognized by any farmer and farmer educator who is interested in cutting down costs of production, establishing a balanced farm program, and improving and maintaining the fertility of the soil.

Fertilizers and Erosion

A concise statement of the role of fertilizers in keeping our topsoils from "going to sea" is to be found in the foreword in Bulletin 518 of the Missouri Agricultural Experiment Station—"Cropping Systems for Soil Conservation" by Dwight D. Smith, Darnell M. Whitt, and Merritt F. Miller. This foreword was written by Wm. A. Albrecht, Chairman, Department of Soils, of the Missouri College of Agriculture and internationally known soil scientist, who says in part:

"The recent emphasis on conservation in general, and on soil conservation in particular, is the delayed recognition of the great cardinal principle that, in nature, the many component parts are dependent one on the other and reinforce each other. According as the soils are deeper, more granular, and more fertile, they are less erosive. Their openness encourages infiltration of the water, and their stability of granulation resists dispersion by the falling rain and removal by the running water. These better soils grow more vegetation for more cover which in turn puts more organic matter into the soils to reduce erosion when they are delivering greater agricultural output.

"However, such reinforcement of the crops by the soil and of the soil by the crops is not possible under cultivation unless provision of the necessary fertility and return to the soil of its own organic matter creations are parts of the soil management. The choice then of a particular cropping system for soil conservation is first, an opportunity to arrange for protective vegetative cover during the maximum time, and second, an opportunity to introduce the lime and other fertilizers for building up the organic matter in the soil. By such reinforcement of nature, the body of the soil will be strengthened to make it more able to save itself from erosion. At the same time the economics of production will be improved. Whatever the cropping system, its service in soil conservation will depend much on what we help it do through the effects on the soil itself."

The authors of the bulletin, basing their conclusions on various studies by the Experiment Station from 1917 to the date of their writing, have this to say in their summary:

"High fertility and erosion control go hand in hand. When not existent, fertility must be supplied by the use of fertilizers, manure, etc. Erosion from small grain has been reduced one-half by the use of fertilizers. Vigorous grass and legume sods before corn, as a result of increased fertility, reduced erosion under the corn to less than one-half that following a grass-legume mixture that deteriorated through a decline in fertility. Crop sequences for effective soil conservation provide (a) maximum of cover protection, and (b) soil conditioning to resist erosion when a new crop is seeded or when row crops are grown."

This importance given to the role of fertilizers in lessening the losses of our valuable topsoils is of value to the whole conservation program. Too often farmers and others have considered that ditching, terracing, and other devices to control water run-off were all that were necessary. With soil fertility taken into consideration in order to insure both greater soil porosity and bigger yields of "soil-holding" crops, the problem of keeping our soils from "going to sea" should be made easier.

"None of us in the Nation can afford wasteful agricultural production or soil destruction. We are *all* affected by such waste, whether we live in a shack or a millionaire's penthouse apartment. In the last analysis, every man, woman, and child depends for life on the fertility of the land. And the continuing fertility of the land, in turn, depends upon a great many economic and social factors."—*Secretary of Agriculture Charles F. Brannan.*

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay[1] Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.6	64.2	88.4	11.87	22.55	....
1924.....	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941.....	17.0	26.4	80.7	94.0	75.1	94.4	9.67	47.65	....
1942.....	19.0	36.9	117.0	119.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	122.0	218.0	156.0	191.0	16.70	71.90	....
1947.....	31.3	38.0	156.0	215.0	235.0	241.0	17.30	85.40	....
1948									
September...	30.94	46.7	153.0	232.0	178.0	197.0	18.00	68.10	....
October.....	31.07	50.6	142.0	207.0	138.0	198.0	18.40	63.70	....
November...	30.52	42.8	144.0	198.0	121.0	204.0	18.40	69.00	....
December....	29.63	45.7	154.0	219.0	123.0	205.0	19.10	68.80	....
1949									
January.....	29.27	42.9	166.0	236.0	125.0	202.0	19.80	65.70	....
February....	29.14	29.5	172.0	244.0	112.0	194.0	20.50	53.40	....
March.....	28.74	31.9	174.0	254.0	118.0	198.0	20.00	51.40	....
April.....	29.91	24.7	181.0	275.0	122.0	200.0	19.00	50.30	....
May.....	29.97	32.5	181.0	273.0	122.0	200.0	17.70	50.40	....
June.....	30.13	31.5	175.0	264.0	121.0	186.0	16.40	46.70	....
July.....	30.08	56.5	155.0	283.0	125.0	182.0	15.65	37.50	....
August.....	29.32	44.6	154.0	267.0	118.0	179.0	16.05	44.40	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1924.....	185	190	98	170	166	141	107	147	143
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	93	81	109	74	87	110
1938.....	69	196	80	83	76	64	57	97	88
1939.....	73	154	100	85	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	107	117	107	81	211	129
1942.....	153	369	168	136	143	124	91	202	163
1943.....	160	405	188	232	174	154	125	231	245
1944.....	167	420	214	219	170	160	138	234	212
1945.....	181	366	205	232	198	170	127	227	224
1946.....	263	382	175	249	212	209	141	319	204
1947.....	252	380	224	245	366	273	146	379	249
1948									
September...	250	467	220	264	277	223	152	302	150
October.....	251	506	204	236	215	224	155	282	176
November...	246	428	207	226	188	231	155	306	186
December....	239	457	220	250	192	232	161	305	209
1949									
January.....	236	429	238	269	195	229	169	291	282
February....	235	295	249	279	174	219	173	237	285
March.....	232	319	250	290	184	224	168	228	263
April.....	241	247	260	314	190	226	160	223	236
May.....	242	325	260	312	190	226	149	224	213
June.....	243	315	251	301	188	210	138	207	175
July.....	243	565	222	323	195	206	132	166	185
August.....	236	446	221	305	184	202	135	197	174

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948						
September	3.00	2.20	10.70	9.87	9.18	9.03
October	3.00	2.20	9.31	9.98	9.41	9.48
November	3.00	2.20	11.00	10.31	10.44	10.68
December	3.00	2.20	11.52	11.65	11.39	11.46
1949						
January	3.15	2.23	10.29	8.68	11.53	11.53
February	3.19	2.27	9.44	12.36	10.78	10.70
March	3.19	2.27	9.27	12.36	9.64	9.71
April	3.19	2.27	9.22	12.36	9.71	9.87
May	3.19	2.27	9.43	12.36	9.71	9.11
June	3.19	2.28	9.65	13.34	10.02	9.71
July	3.19	2.32	11.07	14.97	11.53	10.78
August	3.19	2.32	11.88	14.49	22.75	12.14
	Index Numbers (1910-14 = 100)					
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948						
September	112	77	306	280	272	257
October	112	77	266	283	279	269
November	112	77	314	292	310	303
December	112	77	329	330	338	326
1949						
January	118	78	294	246	342	328
February	119	80	270	350	320	304
March	119	80	265	350	286	276
April	119	80	263	350	288	280
May	119	80	269	350	288	259
June	119	80	276	378	297	276
July	119	81	316	424	342	306
August	119	81	339	410	378	345

Wholesale Prices of Phosphates and Potash* *

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1924	.502	2.31	6.60	.582	.860	23.72	.472
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.498	.706	18.93	.195
1948							
September	.770	4.61	6.60	.353	.679	13.63	.188
October	.763	4.61	6.60	.375	.720	14.50	.200
November	.770	4.61	6.60	.375	.720	14.50	.200
December	.770	4.61	6.60	.375	.720	14.50	.200
1949							
January	.770	4.61	6.60	.375	.720	14.50	.200
February	.770	4.61	6.60	.375	.720	14.50	.200
March	.770	3.85	7.06	.375	.720	14.50	.200
April	.770	3.85	7.06	.375	.720	14.50	.200
May	.770	3.85	7.06	.375	.720	14.50	.200
June	.770	3.66	7.06	.330	.634	12.76	.176
July	.770	3.60	5.87	.353	.679	13.63	.188
August	.770	3.60	5.47	.353	.679	13.63	.188
Index Numbers (1910-14 = 100)							
1924	94	64	135	82	90	98	72
1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948							
September	144	128	135	65	71	56	82
October	142	128	135	68	76	60	83
November	144	128	135	68	76	60	83
December	144	128	135	68	76	60	83
1949							
January	144	128	135	68	76	60	83
February	144	128	135	68	76	60	83
March	144	107	145	68	76	60	83
April	144	107	145	68	76	60	83
May	144	107	145	68	76	60	83
June	144	101	145	62	67	53	80
July	144	100	120	65	71	56	82
August	144	100	112	65	71	56	82

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	151	94	57	160	117	77
1944.....	195	176	152	96	57	174	120	76
1945.....	202	180	154	97	57	175	121	76
1946.....	233	202	177	107	62	240	125	75
1947.....	278	246	222	130	74	362	139	72
1948								
September.	290	265	247	131	94	287	144	68
October...	277	263	243	130	94	277	142	72
November.	271	262	239	134	94	311	144	72
December..	268	262	237	137	94	336	144	72
1949								
January...	268	260	233	136	97	313	144	72
February..	258	257	231	136	99	309	144	72
March....	261	258	231	134	99	290	144	72
April.....	260	258	229	134	99	291	144	72
May.....	256	257	227	134	99	293	144	72
June.....	252	257	223	134	99	304	144	65
July.....	249	256	225	140	100	349	144	68
August....	245	254	222	143	100	372	144	68

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Boron as a Factor in Arizona's Agriculture," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Tech. Bul. No. 118, March 1949, H. V. Smith.

"Fertilizing Materials—1948," Bu. of Chem., State Dept. of Agr., Sacramento, Calif., Spec. Publ. No. 231, March 1949.

"Annual Report for the Calendar Year 1948," State Dept. of Agr., Sacramento, Calif., Reprint from The Bulletin, Vol. XXXVII, No. 4, Oct., Nov., Dec. 1948, A. B. Lemmon.

"Sales of Commercial Fertilizers and of Agricultural Minerals Reported to Date for Quarter Ended March 31, 1949," Bu. of Chem., State Dept. of Agr., Sacramento, Calif., Announcement No. FM-180, May 31, 1949.

"Principles of Composting," Agr. Exp. Sta., Dept. of Soils, New Haven, Conn., Spec. Bul. Soils V/200, June 1, 1949.

"The Fertilization of Shade Trees," Dept. of Soils, Agr. Exp. Sta., New Haven, Conn., Spec. Bul. Soils VI/250, June 3, 1949, H. A. Lunt.

"Reports on Experimental Plots for Fertilizer Treatment, Variety Tests for the Year 1948," Dept. of Agron., College of Agr., Univ. of Ga., Athens, Ga., Unno. mimeo., Jan. 21, 1949.

"The Kansas Commercial Fertilizer Law," Amended by the Legislature of 1949.

"Tonnage of Commercial Fertilizer Reported by Manufacturers as Shipped to Kansas in the Fall of 1948, by Counties," State Board of Agr., Control Div., Topeka, Kansas, Dec. 1, 1948.

"Letter to the Feed and Fertilizer Trade," Dept. of Feed and Fertilizer, Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Feb. 15, 1949.

"Louisiana Fertilizer Report—Fertilizer Consumption, Fertilizer Recommendations, Fertilizer Analysis, 1947-1948," State Dept. of Agr. and Immigration, Baton Rouge, La., E. A. Epps, Jr.

"Commercial Fertilizers, 1948," Agr. Exp. Sta., Orono, Maine, Official Inspections 209, Oct. 1948, E. R. Tobey.

"Efficient Fertilization of Potatoes in Maine," Agr. Ext. Serv., Univ. of Maine, Orono, Maine, Ext. Bul. 373, March 1948, Arthur Hawkins, G. L. Terman, and O. L. Wyman.

"Fertilization of Sugar Beets in the Red River Valley," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Sta. Bul. 399, June 1948, C. O. Rost, H. W. Kramer, and T. M. McCall.

"Fertilizer Trials in Mower County, 1948," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Soil Series No. 25, Hormel Institute Publ. No. 39, April 1949, A. C. Caldwell.

"A Progress Report of Fertilizing Oats on Several Soil Types in East Central Minnesota in 1948," Agr. Exp. Sta., Univ. of Minn., Soil Series No. 27, May 1949, J. M. MacGregor and E. R. Duncan.

"Commercial Fertilizer Report for 1948," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 460, Feb. 1949, A. H. Kruse.

"Fertilizer and Lime Recommendations for New Jersey," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 521, Dec. 1948.

"Analyses of Commercial Fertilizers for Fiscal Year 1947-1948," Bulletin of the N. C. State Dept. of Agr., Raleigh, N. C., Number 116, June 1949.

"Fertilizer Studies on Small Grains with Special Emphasis on Time and Rate of Nitrogen Application," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. No. 209, Feb. 1949, O. H. Long and J. A. Ewing.

"Effects of Fertilizers Upon the Yield and Grade of Cabbage," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1145, Jan. 14, 1949, W. R. Cowley, N. P. Maxwell, and C. C. Edwards.

"Fertilizers for Western Washington," Ext. Serv., State College of Wash., Pullman, Wash., Ext. Bul. No. 386, March 1949.

"Fertilizer Tonnage Sales Survey Report for Washington, July 1, 1947 to June 30, 1948," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Sta. Cir. No. 76, May 1949, S. C. Vandecaveye.

Soils

"East Alabama Soil Conservation District—Supervisors Annual Report, January 1-December 31, 1948."

"Land Drainage," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 391, April 1949, W. W. Weir.

"Eliminating Tillage in Citrus Soil Management," Agr. Ext. Serv., Univ. of Calif., Berke-

ley, Calif., Cir. 150, March 1949, J. C. Johnston and Wallace Sullivan.

"Effects of Certain Soil Conditions and Treatments upon Potato Yields and the Development and Control of Potato Scab," Agr. Exp. Sta., Univ. of Maine, Orono, Maine, Bul. 463, Dec. 1948, G. L. Terman, F. H. Steinmetz, and Arthur Hawkins.

"Our Teeth and Our Soils," Agr. Exp. Sta., Univ. of Mo., Cir. 333, Dec. 1948, Wm. A. Albrecht.

"Soil Conservation Districts in North Dakota," Ext. Serv., N. D. Agr. College, Fargo, N. D., Spec. Cir., March 1949.

"Conservation Farming in Marion County, South Carolina," Clemson Agr. College, Clemson, S. C., Cir. 317, June 1948, S. C. Agronomy Committee.

"Mineral Elements in Our Soils and Foods," Ext. Serv., Univ. of Vt., Burlington, Vt., M 4085/3-4/49-1000, A. R. Midgley.

"The Range Lands of Wyoming," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Bul. No. 289, Feb. 1949.

"Agricultural Conservation Program—State Summaries of Practices, 1947," Prod. and Mktg. Admin., U.S.D.A., Washington, D. C., March 1949.

Crops

"Fifty-ninth Annual Report for the Year Ending June 30, 1948," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Jan. 1, 1949.

"A Study of Lime-induced Chlorosis in Arizona Orchards," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Tech. Bul. 117, Feb. 1949, W. T. McGeorge.

"4-H Gardening," Ext. Serv., Univ. of Ark., Fayetteville, Ark., Cir. No. 359, rev. Apr. 1948, E. J. Allen and L. H. Burton.

"4-H Club Manual in Growing Early Irish Potatoes," Ext. Serv., Univ. of Ark., Fayetteville, Ark., Cir. No. 380, Rev. March 1948, E. J. Allen.

"Twenty-ninth Annual Report—Period Ending December 31, 1948," State Dept. of Agr., Sacramento, Calif., Vol. XXXVII, No. 4, Oct., Nov., Dec., 1948.

"Progress Report, 1937-1946," Dominion Exp. Sta., Can. Dept. of Agr., Saanichton, B. C., Can.

"Progress Report, 1937-1946," Dominion Exp. Sta., Can. Dept. of Agr., Lethbridge, Atla., Can.

"Factors Influencing Tomato Production in Delaware," Agr. Exp. Sta., Univ. of Del., Newark, Del., Bul. No. 277, Jan. 1949, E. P. Brasher.

"Cliett Bunch Porto Rico Sweet Potato Proves Superior to Standard Vining Porto Rico," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper No. 60, April 1949.

"Improved Cultural Practices for Sweet Potatoes," Ga. Coastal Plain Exp. Sta., Mimeo. Paper No. 62, May 1949.

"The Production of Watermelons in the Coastal Plain of Georgia," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper No. 63, May 1949.

"Lupines for Green Manure," Ga. Exp. Sta., Univ. of Ga., Experiment, Ga., Press Bul. 610, May 12, 1949, J. M. Elrod.

"Koa Haole (Leucaena glauca) Its Establishment, Culture and Utilization as a Forage Crop," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, Hawaii, Bul. 100, June 1949, M. Takahashi and J. C. Ripperton.

"The Anthurium and Its Culture," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, Hawaii, Ext. Cir. #264, April 1949, A. M. Hieronymus.

"Green Manure Crops for Idaho Farms," Ext. Div., Univ. of Idaho, Moscow, Idaho, Ext. Cir. No. 105, Nov. 1948, V. T. Smith.

"Agricultural Extension Points the Way," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., 35th A. R. 1947.

"The Lawn—Its Making and Maintenance," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Bul. 254 (3rd rev.).

"Asparagus Production," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Bul. 339, 1948, W. B. Ward and N. K. Ellis.

"The Next Step with Your Trees and Shrubs," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Bul. 340, 1948.

"Wheat Improvement in Southwestern Indiana and Southeastern Illinois," 3rd A. R., Purdue Univ., Lafayette, Ind., 1948, H. R. Lathrope.

"Ten Pointers on Tree Windbreaks," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Leaflet No. 294, 1949.

"Contributions from Iowa Corn Research Institute," Agr. Exp. Sta., Ames, Iowa, Vol. 3, No. 2, June 1948, J. C. Cunningham.

"Fourteenth Biennial Report of the Director for the Biennium July 1, 1946, to June 30, 1948," Agr. Exp. Sta., Kans. State College, Manhattan, Kans.

"A Preliminary Report on Experiments Conducted by the Crops and Soils Department of the Louisiana Agricultural Experiment Station, 1948," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., W. G. Taggart.

"Lawn Management," Ext. Serv., Univ. of Mass., Amherst, Mass., Leaflet No. 85, Rev. Oct. 1948, L. S. Dickinson.

"The Green Pastures Program for 1949 Will Help You," Ext. Serv., Univ. of Mass., Amherst, Mass.

"Eighty-seventh Annual Report of the Secretary of the State Board of Agriculture of the State of Michigan, and Sixty-first Annual Report of the Agricultural Experiment Station from July 1, 1947 to June 30, 1948," Mich. State College, Lansing, Mich., Vol. 43, No. 23, May 1949.

"Thirteenth Biennial Report for the Fiscal Years Ending June 30, 1947, and June 30, 1948," State Dept. of Agr., Lansing, Mich.

"Strawberry Growing in Michigan," Coop.

Ext. Serv., Mich. State College, East Lansing, Mich., Ext. Bul. 297, R. E. Loree, Ray Hutson, and Donald Cation.

"Cotton Variety Tests in the Yazoo-Mississippi Delta, 1945-47," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 458, Oct. 1948, J. B. Dick and S. G. Brain.

"Corn Hybrids and Varieties in Mississippi—1948 Tests," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 460, March 1949.

"Sudan or Millet for Summer Grazing," Ext. Serv., State College, Miss., Leaflet 86 (Rev. 50M), April 1949, W. R. Thompson.

"Double Mississippi's Corn Yield—A Contest for 4-H Club Members," Ext. Serv. and Amer. Potash Inst., W. R. Thompson, State College, Miss.

"1948 Yield Trials with Corn Hybrids in Missouri," Agr. Ext. Serv., Univ. of Mo., Columbia, Mo., Manual 48, Jan. 1949, M. S. Zuber and W. E. Aslin.

"Sow Winter Barley for Fall Pasture and Early Grain," Agr. Ext. Serv., Mo. Univ., Columbia, Mo., Mo. 23E—4/48—25M.

"Science and the Land," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., 69th A. R., 1947-48.

"Strawberry Growing in New Jersey," Ext. Serv., Rutgers Univ., New Brunswick, N. J., Ext. Bul. 253, Feb. 1949, E. G. Christ.

"Science Working for New Mexico Farms and Ranches," Agr. Exp. Sta., N. M. College of A & M Arts, State College, N. M., 59th A. R., 1947-48.

"Sixty-seventh Annual Report of the New York State Agricultural Experiment Station, Geneva, New York, 1948," Cornell Univ., Ithaca, N. Y.

"Better Rural Living," Agr. Ext. Serv., Univ. of N. C., Raleigh, N. C., A. R. 1948.

"Raising Beef Cattle," Agr. Ext. Serv., Univ. of N. C., Raleigh, N. C. Ext. Cir. No. 268 (rev.), March 1949.

"Carolina Lawns," Agr. Ext. Serv., Univ. of N. C., Raleigh, N. C., Ext. Cir. No. 292, Nov. 1948, J. H. Harris and R. L. Lovvorn.

"What Makes Your Yard Beautiful?" Agr. Ext. Serv,, Univ. of N. C., Raleigh, N. C., Ext. Cir. No. 335, Jan. 1949, John Harris.

"More Corn Per Acre," Agr. Ext. Serv., Univ. of N. C., Raleigh, N. C., E. R. Collins and B. A. Krantz.

"Farm Science and Practice," Agr. Exp. Sta., Wooster, Ohio, 67th A. R., Bul. 660, Nov. 1948.

"Winter Pasture for More Feed and Better Feed at Lower Cost," Agr. Exp. Sta., Okla. A & M, Stillwater, Okla., Bul. No. B-333, May 1949, H. W. Staten and V. G. Heller.

"Cotton Production, Variety and Fertilizer Recommendations," Ext. Serv., Okla. A & M, Stillwater, Okla., Cir. 504, W. Chaffin and J. D. Flemming.

"Feeding and Breeding Tests with Sheep, Swine, and Beef Cattle—Progress Report: 1948-49," Agr. Exp. Sta., Okla. A & M, Stillwater, Okla., Misc. Publ. 15, May 1949, D. F. Stephens, O. B. Ross, W. D. Campbell, R. W. MacVicar and A. E. Darlow.

"Oregon's Agricultural Progress through Research," Agr. Exp. Sta., Corvallis, Oreg., Sta. Bul. 461, Dec. 1948.

"Will Rhode Island Have the Greenest Pastures?" Ext. Serv., R. I. State College, Kingston, R. I., J .W. Atwood and H. G. Allbritten.

"Sweet Potato Production in South Carolina," Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 326, Jan. 1949, H. A. Bowers.

"Progress Report of Research in Crops and Soils at the South Dakota Experiment Station," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Cir. 72, June 1948, W. W. Worzella, A. N. Hume, L. F. Puhr, J. E. Grafius, C. J. Franzke, D. B. Shank, V. A. Dirks, J. G. Ross, M. W. Adams, and R. A. Cline.

"Plains Barley," Agron. Dept., Agr. Exp. Sta., S. D. State College, Brookings, S. D., Cir. 74, April 1949, J. E. Grafius.

"Variety Performance Trials of Corn, Oats, Barley, Wheat, Soybeans, and Cotton—Data for 1948 with Summaries of Results from Previous Years," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. No. 208, Jan. 1949, S. F. McMurray.

"The Miles Watermelon—A New Wilt-resistant Variety," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. No. 103, Dec. 1948, J. M. Epps and C. D. Sherbakoff.

"Rhodesgrass for Hay and Pasture in South Texas," Ext. Serv., Texas A & M, College Station, Texas, C-245, 1949, R. R. Lancaster.

"Weslaco Cotton Variety Test, 1944-48," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1146, Jan. 24, 1949, W. R. Cowley.

"Crop Variety Tests at the Blackland Experiment Station," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1147, Jan. 27, 1949, J. W. Collier, W. O. Trogdon, and J. R. Johnston.

"Sweet and Common Sudan Grass for Pasturage," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1149, Cattle Series 74, Feb. 9, 1949, E. M. Neal, R. A. Hall, and J. H. Jones.

"Grain and Forage Sorghum Test, Big Spring Field Station, 1944-48," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1168, May 13, 1949, F. E. Keating.

"Wheat Varieties for the Texas Panhandle," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1170, May 23, 1949, K. B. Porter and C. J. Whitfield.

"Grass Silage," Agr. Ext. Serv., Univ. of Vt., Burlington, Vt., Brieflet 821, May 1949, L. H. Smith.

"Watercress Growing," Agr. Exp. Sta., Blacksburg, Va., Bul. 424, Feb. 1949, G. M. Shear.

"Eighteenth Biennial Report," State Dept. of Agr., Olympia, Wash.

"Lawns," Ext. Serv., Univ. of Wis., Madison, Wis., Stencil Cir. 244 (Rev. Dec. 1948), J. G. Moore.

"Growing Onions in Wisconsin," Ext. Serv., Univ. of Wis., Madison, Wis., Stencil Cir. 283, Dec. 1948, J. G. Moore and O. B. Combs.

"The Inheritance of Tuber-set in Solanum tuberosum L.," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Bul. 287, Dec. 1948, W. A. Riedl.

"Progress Report on Some Range and Grass Research, Archer Field Station," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Wyo. Range Management Issue No. 1, June 1948.

"Native Vegetation in Relation to Soil in Parts of Wyoming," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Wyo. Range Management Issue No. 3, Sept. 1948, H. Bindschadler.

"An Annotated Index to Grass Names," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Wyo. Range Management Issue No. 4, Oct. 1948, A. A. Beetle.

"Trees—The Yearbook of Agriculture, 1949," U.S.D.A., Washington, D. C.

"Report of the Administrator of Agricultural Research, 1948," Agr. Research Admin., U.S. D.A., Washington, D. C.

"Yield and Composition of Cottonseed as Influenced by Fertilization and Other Environmental Factors," U.S.D.A., Washington, D. C., Tech. Bul. No. 974, Feb. 1949, W. H. Tharp, J. J. Skinner, J. H. Turner, Jr., R. P. Bledsoe, and H. B. Brown.

Economics

"Marketing Desert Grapefruit," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 221, May 1949, R. E. Seltzer.

"Connecticut Vegetable Industry and Its Outlook for 1949," State Dept. of Farms and Markets, Hartford, Conn., Bul. No. 103, April 1949.

"Indiana Crops and Livestock," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., No. 280, Jan. 1949.

"Management Problems on Sweet Potato Farms, St. Landry and Lafayette Parishes," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Mimeo. Cir. No. 90, Jan. 1949, F. D. Barlow, Jr. and E. R. McCrory.

"Rural Organization in Three Maine Towns," Agr. Ext. Serv., Univ. of Maine, Orono, Maine, Bul. No. 391, June 1949, D. G. Hay, D. Ensminger, S. R. Miller, and E. J. Lebrun.

"Index Numbers and Seasonal Variations of Prices of Farm Commodities, Mississippi, 1909-1948," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. No. 456, July 1948, D. W. Parvin.

"Forecasting the Price of Corn on the Basis of Current Crop Reports," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Research Bul. 431, Feb. 1949, E. T. Hadorn.

"If Not Potatoes—WHAT?" Agr. Exp. Sta., Rutgers Univ., New Brunswick, New Jersey, Cir. 523, February 1949.

"North Carolina Agricultural Statistics," N. C. Crop Reporting Serv., State Dept. of Agr., Raleigh, N. C., 1948 Annual Issue, No. 90.

"Cost of Producing Red Raspberries (for Processing) in the Willamette Valley, Oregon —A Progress Report," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Cir. of Info. No. 440, Nov. 1948, G. W. Kuhlman and D. C. Mumford.

"Cost of Producing Black Raspberries (for Processing) in the Willamette Valley, Oregon —A Progress Report," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Cir. of Info. No. 441, Nov. 1948, G. W. Kuhlman and D. C. Mumford.

"Cost of Producing Loganberries (for Processing) in the Willamette Valley, Oregon —A Progress Report," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Cir. of Info. No. 443, Dec. 1948, G. W. Kuhlman and D. C. Mumford.

"An Economic Study of Family-sized Farms in Puerto Rico, San José Farm Security Administration Project, 1943-44, 1944-45," Agr. Exp. Sta., Univ. of Puerto Rico, Río Piedras, P. R., Bul. No. 77, June 1948, Guillermo Serra and Manuel Pinero.

"The Agricultural Outlook, South Carolina, 1949," Ext. Serv., Clemson Agr. College, Clemson, S. C., Ext. Cir. 322, Dec. 1948, M. C. Rochester.

"Economic Land Classification of Richmond County," Agr. Exp. Sta., Blacksburg, Va., Bul. 418, Jan. 1949, G. W. Patteson, A. J. Harris, and Z. M. K. Fulton, Jr.

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Why I Save Soil

By Alton G. Wilson

Route 5, Reidsville, North Carolina

SOME authorities say that we have per capita about 14½ acres of all land in waste woods, rivers, roads, cities, home sites, etc. We have 3½ acres of cropland to provide food and fiber for each of us. The minimum requirement per person is around 2½ acres, which means we have an acre from which the produce may be sold.

If our present rate of erosion continues and population keeps increasing, the time is coming when we will lack the necessary cropland per capita. We now have 282 million acres of land completely lost by erosion and 775 million more in a seriously eroded condition. We have lost by erosion the area of a state larger than the average size of a New England state, and there is another area almost three times as great that is suffering tremendous losses.

I am a farmer with about 37½ acres of cropland on my 81-acre farm, enough to produce sufficient food for 15 persons or an average of three families. We are one family on this farm; then this farm is responsible for two other families' food and fiber. If you were one of those other families and knew it and you also knew you could get no food or fiber from any other source, would you not be interested in how good a steward of the soil I would be? If I were to allow the soil to rush toward the ocean with each rain, would you not try to encourage me to do something about this?

I have seen such commonplace foods as lard and fatback become critical during our war period. Food we must have; and soil we must have if we are to have this food, along with conservation if we are to have the soil. This means we must have education, better crops, and better farm management.

Today the fertility and texture of my soil are far ahead of what they were when I bought my farm six years ago, and this improved condition is due to the proper soil conservation practices which I have carried out. Last year I made five bushels of corn where only a bushel grew the year I bought it. This is five times the yield of 1941. Good crops go hand in hand with good conservation and proper fertilization.

Many crops require different rates as well as different analyses of fertilizers. For instance, I have a waterway which we call a meadow strip. It was seeded to ladino clover and orchard grass in 1942. In 1946 the ladino showed signs of receding. From seeing a motion picture presented by the County Agent, showing nitrate, boron, phosphate, and potash deficiencies in plants, I was able at once to recognize potash deficiency in my clover, even though I had used 2-12-12 fertilizer, lime, 50 per cent phosphate, and topdressed with 0-14-7. Looking up the potash requirements of ladino clover I found it to be a heavier user of potash, so I added 200 pounds of 50 per cent potash per acre. The result was almost miraculous. I had ladino equal to my first and second year.

You may ask, what does texture have to do with erosion control? The only way the texture of the soil can be improved is by adding humus, and you may add humus in no better way than growing legumes. When we get a high percentage of humus in our soil it absorbs water. This lessens runoff and stores water for crops during

drought periods. It also reduces floods in our streams. Do you have a stake in this? Yes, if you consume food, use electric power, and in many other ways.

My first obligation was to my parents. My responsibilities are to my family and country, and I shall always be grateful and indebted to my country for the wonderful help and counsel provided by the many government agencies, including the Farmers Home Administration, Soil Conservation Service, Triple A, and the County Agent. So the least I can do is take particular care of my soil, make it produce high and efficiently, so as to pass food on to our people as cheaply as possible and at a fair profit to myself. This I think you have reason to expect of me.

Sweet Potatoes Need Potash

COMMERCIAL fertilizer high in potash is necessary for maximum production of sweet potatoes, especially in northeast and northwest Louisiana. Plenty of the right kind of fertilizer has given yields up to 600 bushels per acre.

Results obtained by the North Louisiana Experiment Station at Calhoun indicated this in 1946. Some 20 or more demonstrations were set up throughout the northeast and northwest section of the State this year. Fertilizer analyzing 4-8-8 or 4-12-8 was used on these demonstrations at the rate of 400 to 600 pounds per acre, applied at least 10 days prior to setting plants to field. These demonstrations were set up chiefly by 4-H Club members who entered a sweet potato production contest. Yields of over 600 bushels per acre were made when fertilizer was increased to 1,000 pounds per acre.

If these fertilizers are not available, get the nearest to them. A 5-10-7 is good and in many instances will be available, as it is used extensively for other crops. Any fertilizer is better than none, but if you can choose, get one analyzing high in potash and phosphorus.

Land for sweet potato production should be selected in the fall. Well-drained, sandy loam soil is ideal. Preparation should begin in the fall as soon as the current year's crop is harvested. Where possible, follow cotton with sweet potatoes. If potatoes are to follow a cotton crop, the cotton stalks should be cut in the fall, while still green, and plowed under as follows: First, plow out the middles and then bed the old row back in the middle with a turn plow or middle buster.

If severe rains occur during the winter, packing the soil and washing the beds down, you can bed back in the middle, making new rows. This should be done not later than the last week in March or the middle of April. In other words, the bed should be made up in time to be water-firmed prior to setting plants in the field. If the beds are flat, fertilizer can be applied when these final beds are being made up. It should be applied four to six inches deep in the bed underneath the area where potato vines are to grow.

The sweet potato plant root grows downward until it reaches soil containing sufficient amounts of moisture for growth. It then begins growing and potatoes are formed as lateral roots branching off from the main root system. If the soil is packed too tightly, potatoes will have a tendency to be rough. Growth will not be uniform, because expansion will be limited by the hard packed soil. It is necessary to build

up high, wide beds in order to allow plenty room for expansion by the sweet potato. Do not plant sweet potatoes after a heavy winter cover crop, as unrotted green matter sometimes causes scurf disease.—*John A. Cox, Extension Horticulturist, Louisiana State University.*

Efficient Vegetable Production

(*From page* 20)

In view of the limited time that this experiment has been in existence, it is pointed out that these results are only preliminary. They may change as the experiment progresses.

Plowing Versus Discing Soils

In recent years the topic of plowing versus discing of soils in preparation for the planting of crops has been popularized by the press, agriculturists, novel writers, and others. In all of this publicity, there seemed to be very little experimental evidence to justify the recommendation of plowing over discing or that of discing over plowing. An experiment was, therefore, designed to test the yielding ability of certain vegetable crops when planted on plowed and on disced soils.

Large plots (36 by 300 feet) were established at the Substation, near Georgetown, Delaware, in 1944. Each treatment was replicated four times. Rutgers tomatoes were grown in 1945, Hale's Best muskmelons in 1946, and Irish Cobbler potatoes in 1947.

Yield differences per acre favoring the plowed areas were as follows: 0.22 tons of tomatoes, 931 muskmelons, and 50 bushels of potatoes. The muskmelon and potato yield differences were highly significant while that of tomato was not significant. Since no significant change could be detected in soil nutrients, pH, and organic carbon content between the plowed and the disced areas, it is believed that as time progressed, the physical condition of the disced plots became less favorable for plant growth. This may possibly explain why there existed such a small difference in tomato yields and such a large difference in the muskmelon and potato yields.

Summary

In the foregoing discussion an attempt has been made to present some of the outstanding soil improvement practices for vegetable crops. Those presented are for the sand and sandy loam soils so typical of peninsula Delaware. The combined characteristics, a thin six- to eight-inch topsoil, the low exchange capacity, deficient nutrients, and a low pH make the following six practices desirable.

1. Encouraging deeper root growth through deepening, enriching, and sweetening the soils by the plowing down of fertilizer, lime, and organic matter.
2. Efficient employment of soil and tissue testing or a combination of soil and tissue testing to determine the optimum nutrient level in soils or crops.
3. Providing adequate amounts of each major element for all vegetable crops through the use of commercial fertilizer or a combination of commercial fertilizer and poultry manure.
4. Determining through field trials, if tissue testing is impractical, the necessity of applying certain minor elements.
5. Growing cover crops whenever the practice is economically sound.
6. Improving the physical condition of the soil not only by adding organic matter but by proper tillage practices.

Experimental evidence and observation indicate that these practices for improving the soil have the potential power to increase the efficiency of vegetable-crop production in Delaware.

A Hoosier Dynasty

(*From page* 27)

deen Angus herd with the purchase of three heifers in 1941. Today they have a foundation herd of 22 cows and heifers representing some of the best Angus families in the country.

Grand dam of the herd is "Enchantrene 6th," now 14 years old, from the Eileenmere family, bred on the Tolan farm near Pleasant Plains, Ill. She won her class at the International Show in Chicago and is full sister to a grand champion at the same show. Her two-year-old son is now herd sire.

During 1948 the Fosters sold 12 head of registered Aberdeen Angus from their herd. Calves are creep-fed and only the steers go to market, since the Fosters are still expanding their herd. Many are sold as 4-H club project calves.

Manure from this herd and from the chicken houses all goes back on the land, for such is the Foster tradition of good husbandry. They even use it to "fence off" weak spots in the birdsfoot trefoil because cattle will not graze areas so treated.

When farmers of Fountain county organized a soil conservation district early in 1944 the Foster farm was among the early ones on which technical assistance was requested. Surprisingly enough, in spite of generations of good farming, it had one erosion problem no Foster had ever been able to solve. This was a major gully which continued eating back into the rolling land on the north 60 acres and carrying water down to flood a lower meadow.

J. Lee Foster and his son had already gone far to improve the woods pasture on the north sixty. They had rigged a circle saw to the power take-off on their tractor and had cleared off all of the woods area except a better stand of timber on a small hill which was fenced off as a farm woodlot. But this did not cure either the gully or the overflow it caused. All of the excess water from 20 acres of Foster land and 80 acres of two adjoining farms, drained down into it.

J. Lee Foster's father fought that gully all of his life, plowing it in only to see a heavy rain erase his efforts. As late as 1939, J. Lee and Paul were still trying to whip the gully by the same system. That year they straddled it with two tractors carrying a pole between them and plowed it in. Then they put in wheat and seeded it to a legume-bromegrass mixture. This helped, but the gully was still far from tamed.

When the soil conservation district, of which J. Lee Foster is a supervisor, was organized, he called in outside help on his gully problem. A representative of the U. S. Soil Conservation Service was assigned to the new district and was soon on the ground looking over the Foster farm. With his technical assistance, the father and son developed a complete farm conservation plan which carried with it a sure-fire cure for the gully.

A thorough engineering job was done in developing a new water disposal system. The flat land at the lower end of the gully had grown up to brush. This was protected from further flooding by a 1,000-foot diversion. It was cleared of brush and developed into a fine meadow. The entire drainageway above the diversion was re-shaped and developed into a grassed waterway. The last sore spot on the 123-year-old Foster farm has been healed.

Eventually, the Fosters plan to seed the entire 60 acres to birdsfoot trefoil, divide it into three equally sized rotation pastures, and graze these on a

schedule of 10 days to a plot. They believe their farm has a potential capacity of 5,000 chickens and 100 head of cattle.

From his work with the soil conservation district and his own success in curing the gully problem, J. Lee Foster believes an adequate amount of technical assistance on the land is the greatest need of the American farmer today. He has also been active in Farm Bureau affairs for some years.

Proof that the permanent type of agriculture the Fosters practice pays off in dollars and cents can be found in a study of their actual records. Purdue University analyzed the accounts of 81 average Indiana farmers who kept books in the disastrous year of 1932. The 81 farmers showed a return of minus eight-tenths of one per cent on their investment that year. The 27 most profitable farms of the group showed a return of plus three per cent. The Foster farm's return on the investment for 1932 was plus 11.8 per cent.

In 1946, 64 Indiana farms, on which accounts were kept, yielded an average of 66.8 bushels of corn to the acre. The Foster farm averaged 90 bushels. The 64 farms averaged 45.1 bushels of oats; the Foster farm, 55 bushels.

That year the 64 Hoosier farms had an average crop yield index of 97. The 21 most profitable farms had an average index of 100. The Foster farm's crop yield index was 136.

As might be expected, a detailed analysis covering the operations of Indiana farmers for the past year has not yet been completed. However, Purdue experts made a careful check of corn yields and in December, 1948, the results were announced. One cornfield on the Foster farm produced 127.6 bushels of corn to the acre while the other made 144.9 bushels. When James Foster broke these same fields back in 1825 he probably would have regarded reports of such yields as another tall tale.

After 123 years of production, the Foster farm is hale and hearty, better than it ever was because that outlying 60 acres of rolling land are safe now from soil losses. At 68, J. Lee Foster faces the future unafraid, either for his own security or for the future security of his farm.

Around the corner from the big comfortable white house which has been the Foster home for these many years, son Paul has built a snug white bungalow. Here he is raising the seventh generation of Fosters, raising them to love the land as all Fosters have before them.

And young Colin who may someday step into his father's shoes has ample evidence before his eyes of how good soil farmed by a good husbandman leads the way to a permanent American agriculture.

Why Use Potash on Pastures?

(*From page* 14)

border check method of irrigation, it is desirable to broadcast the fertilizer only on the upper two-thirds of each irrigation check.

In Extension Bulletin No. 386, "Fertilizers for Western Washington," issued by the State College of Washington, recommendations are given for pastures. It is stated that on soils which show a need for potash 300-400 pounds of a 5-15-10 fertilizer should be used, both to establish new seedings and to fertilize old stands. On muck and peat soils, 200-300 pounds of 0-20-20 or 5-20-20 fertilizer are suggested.

The Old Rotation

(*From page* 23)

dressings or application of nitrogen fertilizer.

The yields of cotton grown continuously with vetch (plots 3 and 8) were somewhat lower than that of the cotton grown in rotation with corn. These plots have produced an average for the last 16 years of slightly more than 1,200 lbs. of seed cotton per acre. The yields produced on these plots in 1944, the forty-ninth year of continuous cotton, were 1,656 and 1,512 lbs. of seed cotton per acre, respectively. This would indicate that the cotton as a crop does not deplete the soil or run it down excessively. The cultural practices of leaving the land bare through the winter and of not preventing erosion are responsible for the generally low fertility level of many soils on which cotton is grown.

Need for Potash

Of further interest is the increased need for potash that developed after the phosphate applications were increased. This was evidenced by the appearance of rust on the cotton grown in the 2-year rotation with peas (plots 5 and 9). In the early years of the experiment the peas were picked for seed and the vines turned under. In 1923 and after, the peas were cut for hay and followed by vetch. As long as the peas were picked for seed, i. e. from 1896 to 1922, cotton yielded more than it did in the rotation with corn (plots 4 and 7). However, soon after the beginning of the removal of the peas for hay the cotton started to decline and the data show that after the 1924-27 period the yields of the cotton in rotation with peas have been gradually declining in comparison to those of cotton in the corn-cotton rotation. In the years just previous to 1944 "cotton rust" was so severe on plots 5 and 9 as to cause the cotton to almost completely lose its leaves. The severe rust of the cotton on these plots is, of course, a potash deficiency and must be ascribed to the removal of the potash in the cowpea hay.

Leguminous Manure

Green leguminous manures are not as effective a source of nitrogen for fall-planted or cool-weather crops as they are for regular summer crops. The

Fig. 3. Cotton on Plot No. 4 in 1948. Rotation of cotton-vetch and corn-vetch. Yield 2597 pounds of seed cotton per acre.

Fig. 4. Corn on Plot No. 7 in 1948. Rotation of corn-vetch and cotton-vetch. Yield 75.8 bushels of corn per acre.

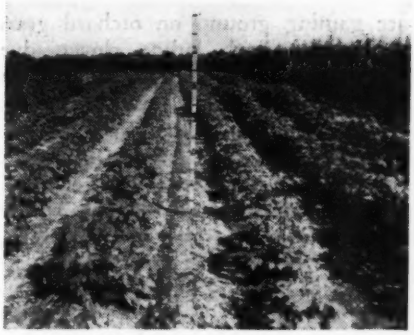

Fig. 1. Cotton on Plot No. 6 in 1948. Cotton alone continuously since 1898. Yield 482 pounds of seed cotton per acre.

Fig. 2. Cotton on Plot No. 8 in 1948. Continuous cotton-vetch since 1896. Yield 1968 pounds of seed cotton per acre.

yield of oats in the 3-year rotation (plots 10, 11, and 12) is a good example of the extent to which cool-weather crops may be limited when leguminous nitrogen alone is used. The average yield of oats obtained from 1896 to 1931 (the yields for only 30 years were available) was 19.9 bushels per acre and from 1932 to 1947, inclusive, when 32 lbs. per acre of supplementary mineral nitrogen were applied annually was 60.5 bushels per acre. Although part of this increase may be due to the larger amounts of phosphate that have been applied since 1920, it is still a phenomenal increase. This increase in oats presents the question of how much the yields of corn and cotton could have been increased by application of supplementary nitrogen fertilization. One would not expect them to be increased as much since oats are a winter crop and make much of their vegetative growth during the season of the year when nitrification is slow.

The Red Hills of the Piedmont

(*From page* 8)

ladino clover-fescue combinations and permanent pasture. Cows were feeding on the dense sods of green turf even though there had been heavy rains the day before. The soil on this entire farm appeared to be tied down with the sod crops, which will prevent erosion and at the same time provide feed crops.

The sun was shining but it was moderately cold and wet on January 20 when we visited the farm of W. J. McAteer, Route 6, Monroe, North Carolina, to see his small cotton farm which has been converted almost entirely to grazing crops within a period of 4 years. It was in 1944 that he reduced the cotton acreage and added a few dairy cows. There are now 7 fields with green grazing crops totaling 48 acres and carrying 17 milking cows and 8 springing heifers. The average daily milk production last winter was 48 gallons. All of the feed consumed is produced on this farm except for some corn that is bought and ground.

This is an example of a small farm that is typical of much of the Piedmont area and one that can be duplicated in a practical way. It was fortunate that

our largest crowd, approximately 250 to 300 local farmers, G. I. farm trainees, local business men, agricultural workers, and our group were present on this farm. There were seedings of small grain—rye grass and crimson clover, orchard grass and ladino clover, barley and Dixie crimson clover, and a pure seeding of ladino clover for a seed patch with 4 hives of bees for pollination. This program is working well toward the balanced farming and uniform distribution of labor throughout the year for which Mr. McAteer is striving.

It might be expected that in the more highly industrialized sections of Durham and Wake Counties, North Carolina, with their higher priced land, less acreage would be devoted to winter grazing. This was not true, however, as it was being successfully practiced in these areas.

It was evident in North Carolina that ladino clover was living up to all of the great things that had been said about it. From our observations, it appears that Alta or Kentucky 31 fescue are gaining ground on orchard grass as partners with ladino clover, due mainly to their wider adaptability in poorly drained as well as upland soils.

In summarizing the value and advantages of winter grazing, foremost seems to be the utilizing of rainfall and soil moisture during the winter when more is available. After all, water is perhaps the greatest limiting factor in plant growth and winter-grazing crops are produced when the Southeast has its highest rainfall. Through them soil conservation is promoted, feed costs and labor costs lowered, and farm income stabilized.

In looking ahead not too far in the future, we can visualize a complete change in the landscape of the Southeast when the bare red hills of the Piedmont are covered in warm green blankets. Here is the opportunity for the Southeast by vigorous and progressive leadership and determination to utilize its full resources of mild temperatures, abundant moisture, and extensive lands for the improvement of farmers and, in turn, all of us.

Our Waning Woodlands

(*From page* 5)

we get from trees. Yet a short side-glance at the subject belongs in any argument respecting better forest cropping. You can get hold of fact sheets that will supply all details, so let's merely scan it in passing.

At the treetop Nature has provided seeds. Countless nuts and fruits come from the reproductive process of trees while oils, extracts, and decorative material are derived from the foliage. From the trunks of special trees we get commercial goods galore, as well as logs, poles, piles, posts, and cordwood. Tree gum from the trunk yields resins, from which we make paints, varnishes, disinfectants, insulators, fireworks, printing ink, crayon, insecticides, adhesives, drugs, chewing gum, and flavoring extract.

Cordwood isn't just to toast our toes either. From it we manufacture tannin, charcoal, dye, pulp, excelsior, tar, creosote, lime, wood alcohol, and obtain by chemistry a multitude of marvels, not to mention all the direct derivatives from wood fiber. The heavy logs are no longer so sizable as of yore, but they still work up into materials varying in function, from stout handles for agricultural implements to delicate musical instruments.

I daresay that no other branch of plant life furnishes as many useful and indispensable materials as do our trees. No wonder folks have begun to regard the oak, elm, pine, and hemlock with as much zest as they have hitherto shown toward apple, peach, and citrus trees.

How are we going about it to get that goal of more growing timber? We'll also get something else, too, in the same process—more wild life and better outdoor fun and refreshment.

EXPERTS reply that more public help to private timber owners is a logical first step. Small owners with small chance for any investment in education or travel must have technical advice, and even some actual show-the-way service. To attain this objective the U. S. Forest Service and forestry departments in many states are engaged in direct contact with large and small owners in nearly 700 counties. That's a good start, but the goal is to provide similar aid in about 2,000 counties.

We have "basic crop" loans galore for the benefit of farmers and presumably for consumers indirectly. It is said that we also need a forest credit system to make long-term loans at reasonable interest rates to the hard-pressed owners of small tracts.

Encouragement of cooperative forest management and cutting associations is a second move which is being investigated. Then, in the direct field of stepping up forest plantings much headway has been made. Fully 3 million acres have already been successfully planted by farmers and other private timber crop owners, but the demand for nursery trees which are growing in numerous areas is far ahead of the available supply. The use of new and rapid tree-planting machines by extension foresters and landowners has recently been a feature of this part of the plan. The original cost of the small trees and a lower cost of putting them in well are both points under constant study. You can't expand any new idea widely if the outlay prohibits ordinary folks from joining in. You likewise need to get a pretty good rate of survival from these tiny young tree sprouts to make results look well in the present and the future.

On the defensive side much remains to be done in fire guarding. Forest Service cooperates with many states under the Clarke-McNary federal law to supervise, direct, and aid in the better protection of private lands from their greatest mass menace. In spite of progress in providing such fire protection, over 99 million acres, or a fourth of the lands owned by states and private individuals, still lack any real organized machinery for halting the ravages of fire.

Car cards and posters, advertisements and radio programs, during the season when outings are customary, all warn people to be extremely cautious about campfires, matches, and smoking when enjoying the beauty of the wild. Forest Service has at least two imaginary characters to emphasize this angle of public conservation. One is Smoky Bear, the wise and watchful denizen of the woodlands, ready with quip and sage reminder; and the other, less well known gent—Willy Everlearn—typifies the neglectful and blundering woods worker who is a constant danger to himself and his associates.

MOTION pictures also have done a great piece of propaganda in behalf of stopping the causes of woodland blazes. These films should get wider showing, especially at midwinter farmers' meetings and at the theaters in summer resort centers.

On top of all natural threats to forest integrity we also have cumbrous and injurious tax laws, some of them adding heavily to the constant pressure put upon small landowners that finally forces more liquidation of timber resources. We need more counsel and suggestions for improved legislation in states where forest tax laws are needlessly harsh and damaging.

And moreover, in a reasonable view of the matter, isn't it just as important to protect forests against destructive cutting methods as it is to guard them against fire? It may seem like closing the w. k. barn door after the nag is swiped to ask for wider and stronger public control of all forest land management—but that idea is taking root and may grow into reality.

If it spreads to a number of states there will be a "regimentation" protest filed by sundry earnest citizens. But regulation of some kind is coming sooner or later, probably by the states using practical standards with which to measure good cutting practices which may be enforced with no harm to the ultimate welfare of any citizen who owns timber tracts.

Probably the national forests serve as an example of what could be done generally in conservation. Much remains to be improved even there. Yet today our national forests, covering 160 million acres on the continent and numbering 150 in 40 states, are said to be in many ways the outstanding forest system of the world.

The principal reasons for their existence as wards of yours and mine lie in various directions. Their resources comprise timber, range, recreation, sustenance of wild life, and conservation of water supplies.

TO begin with the timber thereon, the national forest preserves rate as high as 30 per cent of our Nation's sawtimber volume. Scores of towns and hundreds of busy sawmills rely solely upon the growth in national forests to keep them buzzing. The yearly cut of timber is about 4 billion board feet. With more access roads and funds from timber sales, this volume can be increased by 50 per cent on a sustained yield basis. The Alaska forests are as yet not exploited. In time their pulpwood value will be heavy. Steps to set up a permanent paper-making industry in Alaska are being taken. Large tracts in the public forests are poorly stocked and need thorough replanting as badly as many of the private areas do, but a whole century will probably pass away before the proper end is reached in this regard.

As for the range resources of the national forests, this includes about 85 million acres of the Far West, where seasonal grazing under permit is provided for almost 10 million cattle and sheep. It might be useful to remember that the national forest pastures provide nearly 8 per cent of the entire feed requirements of the sheep and cattle in 11 of these Western Range states, exclusive of intensively fed milk cows.

RESEEDING and sane pasturage are the two factors for protection. About 200,000 acres in the forests owned by the government have been resown with suitable grass and pasture mixtures. But nearly 4 million range acres ought to be seeded if the quality of the forage and the herd management are to benefit properly.

Judging from hearsay, nearly 25 million visitors will invade the bosky aisles and upland meadows of the national forests this year, to spend a little spare time next to Nature. This does not include all of the wandering motorists who just whiz through the forests preserves for a short stay en route somewhere else. Aside from the 4,500 gaming sites and sport areas which the government Forest Service has established, there are national parkways maintained by the Interior Department and hundreds of private resorts and summer homes to make recreation easier and better.

Speaking in behalf of the true natives of the woodlands, there is said to be a third of the country's big game creatures making their homes within the national forests. Plenty of small game, fur-bearing animals, and upland birds share these pristine areas with man. In 1948 over five million hunters and fishermen complied with state game laws and sought to catch the unwary amid the woods and waterfalls.

Within the limits of these vast forests there are at least 90,000 miles of fishing streams and nearly 2 million acres of fishing lakes. In some spots the deer and the elk are doing almost too well by themselves in numbers—to a danger point where the capacity of the range is inadequate to handle them.

And lastly, these government forests are at the headwaters of notable rivers which give aqua pura aplenty to countless towns and cities, and furnish power facilities and water flowage for irrigation projects. The major share of the economy and well-being of a considerable western zone depends upon the conservation of the national forest water resources. To maintain adequate timber and grass cover is the vital point, which means proper cutting, sound grazing, and ample fire-control systems.

This year has seen blizzards and drought and storms, each having some part to play with the underlying forces involved in forest management. If we are to realize our natural inheritance to the fullest, every man jack of us should do his little bit to safeguard the present movement in all good phases of public and private woodland thrift.

FOREST Service capped the year's endeavor with publication of the annual year book issued by U. S. Department of Agriculture. This attractive tome is much in demand. It is properly speaking a Congressional document, one that gets its major distribution through senators and representatives. Our earnest plea and cogent reminder to all and sundry is not to order it from the Department but to solicit your own dearest friend in the halls of legislature, or else buy it from the superintendent of documents.

But whatever you do and whatever strong pledge you make to help the forests, resolve to stick to it through thick and thin and in the face of ax grinders' criticisms. If not, we'll all be up the last tree before long in a land denuded of beauty and devoid of riches.

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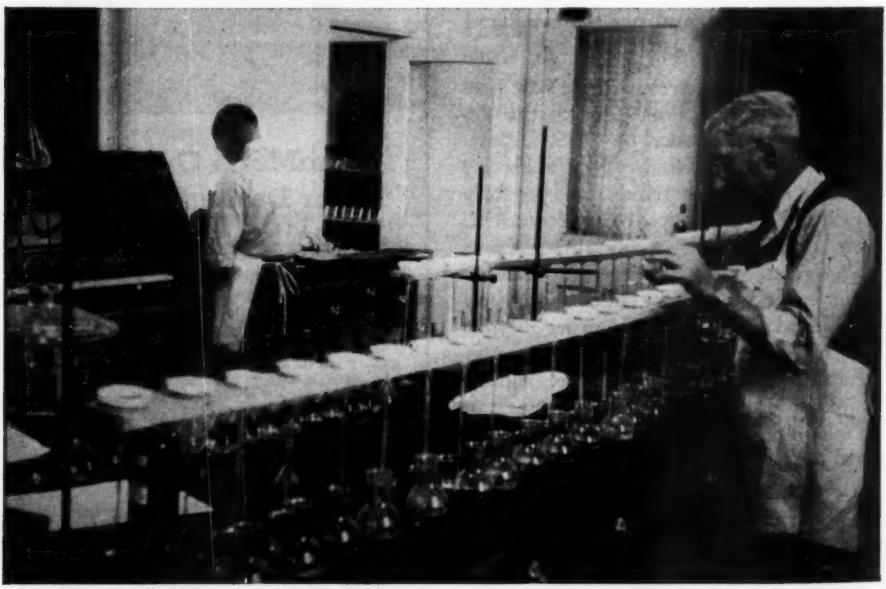
Nitrate tests can be made at the base of the leaf midrib without destroying the entire plant. This is an important consideration in making numerous tests on small experimental plots. The height of the plant at which nitrates are present as well as the intensity of the blue color gives an indication of the nitrate status of the plant.



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AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (General)

Reprints

F-3-40 When Fertilizing, Consider Plant-food Content of Crops
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WW-11-46 Soil Requirements for Red Clover
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A-1-47 Fertilizing Vegetables by Applying Fertilizer to Preceding Cover Crop
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✦ ✦ ✦

This book now available in two printings

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Write: **W. R. Thompson** **State College, Mississippi**

The long-winded lecturer had been holding forth for over an hour, except for brief pauses from time to time to gulp a hasty drink of water. Finally, during one such intermission, an old man in the audience leaned toward his neighbor and announced in a loud whisper: "First time I ever saw a windmill run by water!"

★ ★ ★

Lawyer (to gorgeous witness)—"Answer me, yes or no!"

Witness—"My, you're a fast worker, aren't you?"

★ ★ ★

"What's the matter, Mary?"

"I've got rheumatism in my muscles."

"You ought to visit a masseur."

"What's that?"

"A man who pinches you all over."

"Oh, you mean a Marine!"

★ ★ ★

A young physician and his wife had considerable difficulty teaching a new maid to answer the telephone properly. In spite of repeated instructions she persisted in answering: "Hello," instead of "Dr. Jones' residence." After many practice sessions, everything seemed to be all right. Then one morning the extension in the bedroom rang, and the maid, busy making the bed, grabbed the phone and blurted: "Dr. Jones' bedroom."

★ ★ ★

Some women attain their ends by not taking enough exercise.

On the witness stand, the old mountaineer was as cool as a cucumber and as close as a clam. The prosecuting attorney was beside himself with anger and impatience.

"Sir," hissed the lawyer, "do you swear upon your solemn oath that this is not your signature?"

"Yep," replied the witness.

"Is it not your handwriting?"

"Nope," said the witness.

"Does it resemble your handwriting?"

"Nope."

"Do you swear that it doesn't resemble your handwriting?"

"Yep."

"You take your solemn oath that this writing does not resemble yours in a single particular?"

"Yep."

"How can you be certain?" demanded the lawyer.

"Cain't write," replied the witness.

★ ★ ★

Patient: "Doctor, I blush so easily that it worries me. When I sit down and think, I blush. How can I stop it?"

Psychologist: "The best way, young lady, is to think about something different."

★ ★ ★

Mother: "Daughter, dear, your escort brought you home very late last night."

Daughter: "Yes, it was late, mother. Did the noise disturb you?"

Mother: "No, the silence."

FERTILIZER BORATE

more economical

FOR AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities, or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work and recommendations of the State Agricultural Stations and County Agents are steadily increasing the recognition of the need for Boron in agriculture.

Boron is a plant food element and is commonly obtained from Borax since the element does not occur in the pure form. Fertilizer Borate is a sodium borate ore concentrate containing 93% Borax.

Fertilizer Borate was placed on the market by the makers of "20 Mule Team Borax" as a fertilizer grade product to save cost of refining and hence to supply Borax at the lowest cost.

Fertilizer Borate is packed in 100 lb. sacks. Address your inquiries to the nearest office.

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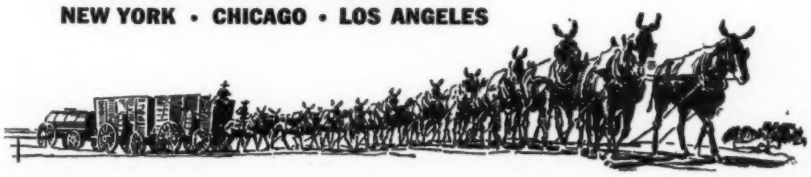


THE PLANT SPEAKS

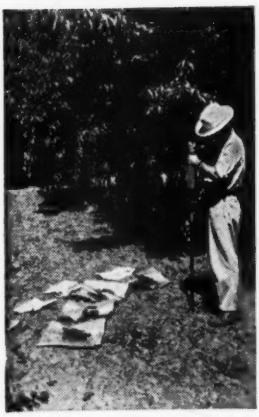
A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)



We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
Save That Soil (All)
Borax From Desert to Farm (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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